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WETLANDS LOSS IN SOUTH FLORIDA

AND THE IMPLEMENTATION OF SECTION 404 OF THE CLEAN WATER ACT

September, 1982

A Report to the

Office of Technology Assessment

Oceans and Environment Program

Congress of the United States

by the

Center for Governmental Responsibility

University of Florida College of Law

Gainesville, Florida 32611

904/392-2237

Principal Investigator: Richard Hamann, Assistant Director

Staff: Cynthia Cart, Secretary
Charles Boyle, Research Assistant

Consultant: Dr. Mark Brown
Center for Wetlands

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Introduction

This study examines the loss of wetlands in South Florida, the consequences of that loss and the effectiveness of regulatory programs, particularly Section 404 of the Clean Water Act, in preventing harm to the people and resources of the region. South Florida was selected for study because it is a region of extensive wetlands that is subject to extreme development pressure. The South Florida region is shown in Figure 1. The boundaries of the study area generally encompass a hydrologic unit that has been well studied. Because of time limitations, this analysis is primarily a synthesis of existing studies supplemented by extensive interviews and material from the files of the Corps of Engineers.

FIGURE 1

The South Florida Study Area[1]

I. The Role of Wetlands in the South Florida Environment[2]

South Florida is very flat and very wet. The peninsula emerged from the ocean about 20,000 years ago and the dunes, bays, reefs and channels of a shallow sea are impressed upon the landscape. The highest lands in South Florida are an old, relict dune line to the west of the Kissimmee River that rises to about 100 feet above sea level. Lake Okeechobee is less than 20 feet above sea level and the land slopes gradually from there to the southwest coast like a giant, slightly tilted saucer. A sand and limestone ridge along the Atlantic forms one rim of the basin and slightly elevated pinelands along the West Coast are another. (See Figure 2.)

The region receives considerable rainfall--an average of 60 inches per year, but it is highly variable. Some years 80 inches might fall, in others 35 inches. Droughts and floods alternate unpredictably. In addition, rainfall is distributed unevenly during the year--there normally is a dry season and a wet season. Most of the rain--75%--falls from May through October. (See Figure 3.) Although most precipitation comes from summer thunderstorms, hurricanes can drop one or two feet of water in several days.

The presence and flow of water is the dominant environmental factor in South Florida. The various communities of plants and animals in South Florida are found in different places primarily because of differences in hydroperiod--the length of time water tends to be present on the surface of the ground--and in the depth of inundation. Relatively small differences in the

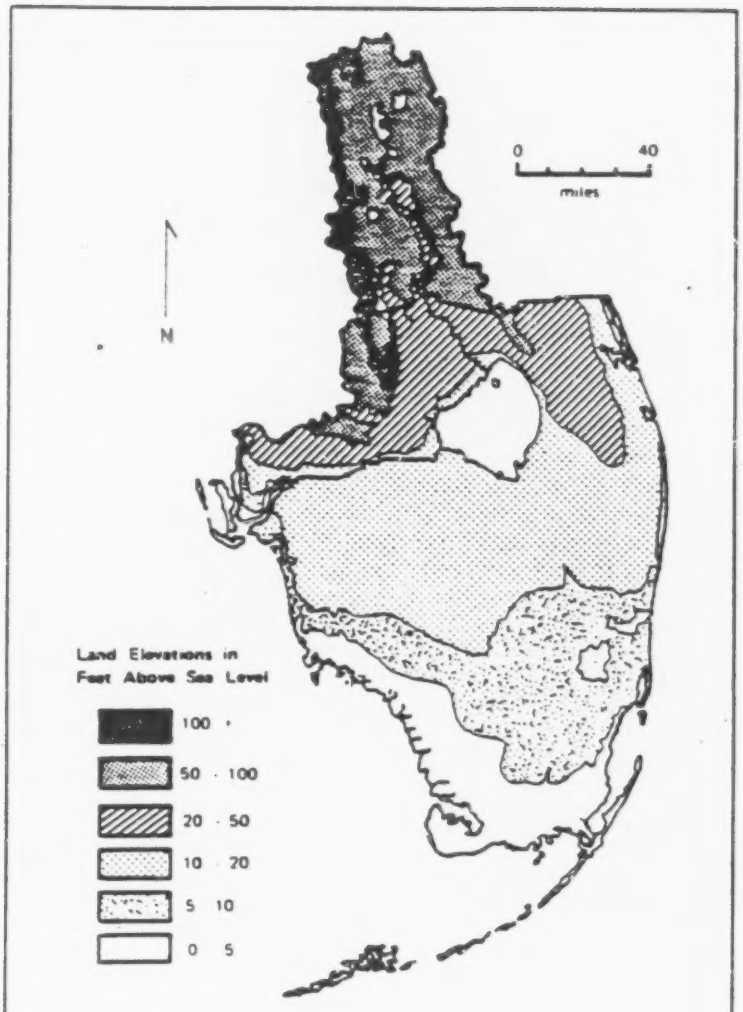


FIGURE 2 Land Elevations in South Florida.[3]

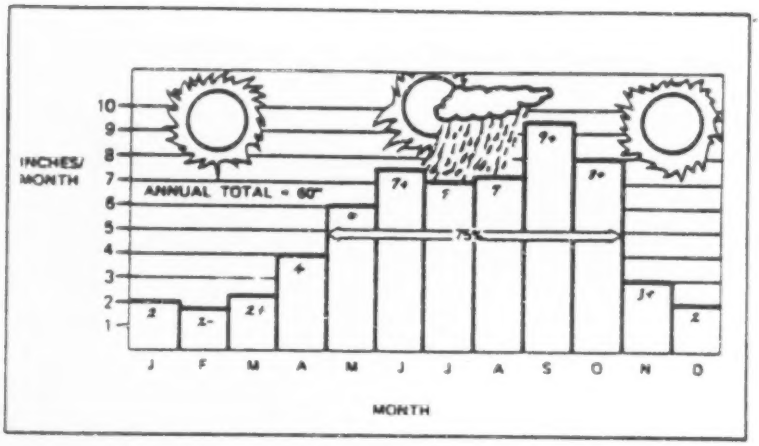


FIGURE 3 Seasonal Rainfall Pattern in South Florida, Miami. [4]

elevation of the ground (or in the elevation of surface waters) can thus have dramatic effects on biological communities. (Figure 4 illustrates this effect.) A six inch difference in elevation may mean that one place is pine land while adjacent lands are cypress.

The flow of water through this system links the various parts together to form a cohesive, mutually interacting environmental unit. Figures 5 and 6 show the regional linkages as they existed prior to alteration. Because South Florida is so flat, water does not flow across the landscape through narrow, well-defined channels. There are few rivers and streams. Instead, water tends to spread across wide areas during the wet season and flow toward the sea in a shallow, slowly moving sheet of water. This phenomenon of sheet flow is found throughout South Florida and is vital to the ecological relationships that have developed in the region. During the wet season, very large areas of aquatic habitat are formed. When dry periods come, these areas shrink, concentrating fish, crustaceans and similar food for the benefit of wood storks, alligators and other predators. Water quality in the system is maintained at a very high level by the action of plant life and sunlight in the shallow waters. One very important characteristic of the sheet flow system is that it moderates the effects of seasonal and cyclic variations in rainfall. Water that is stored in the overflow marshes and swamps, and in the aquifers they recharge, is available for use several months

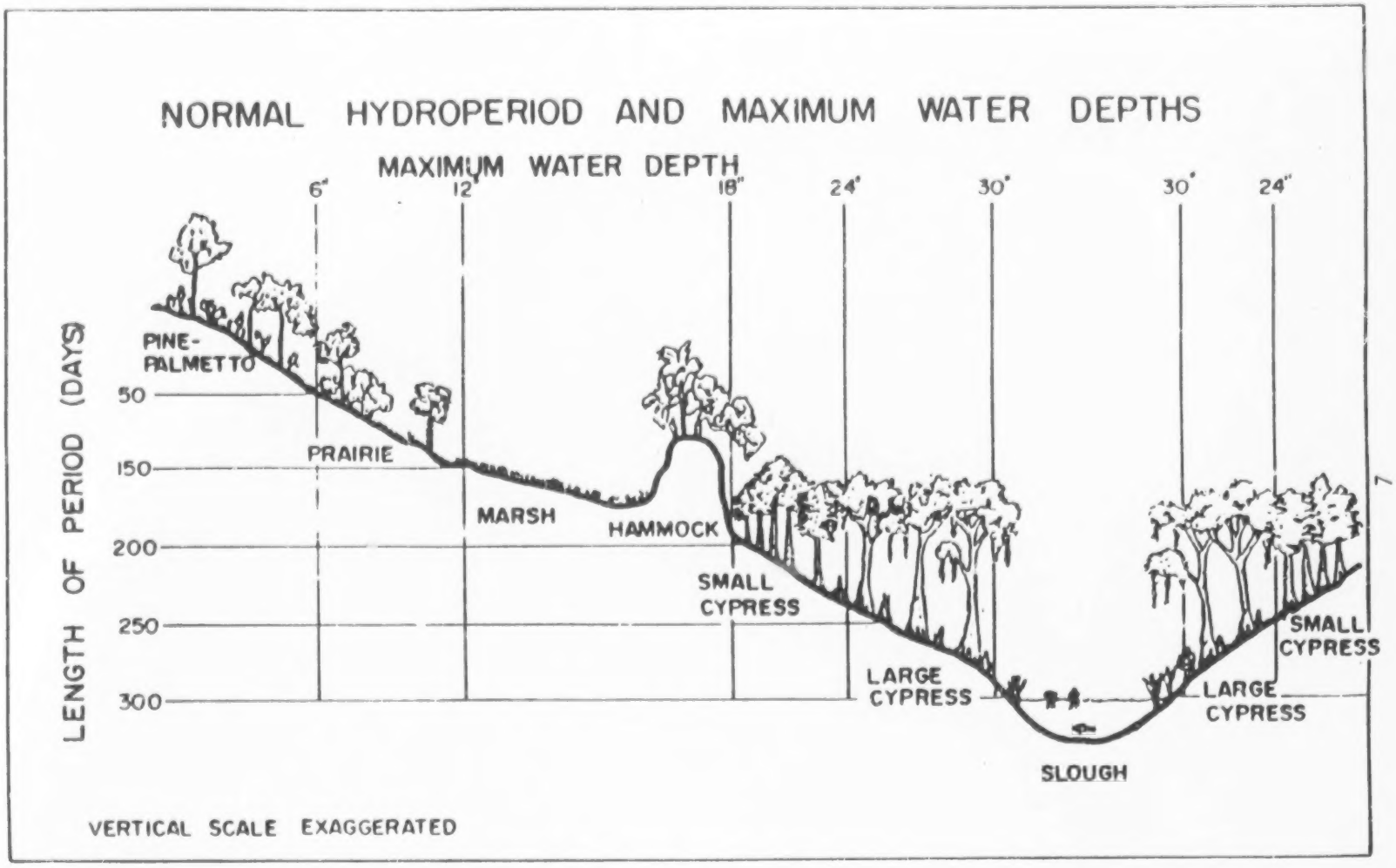
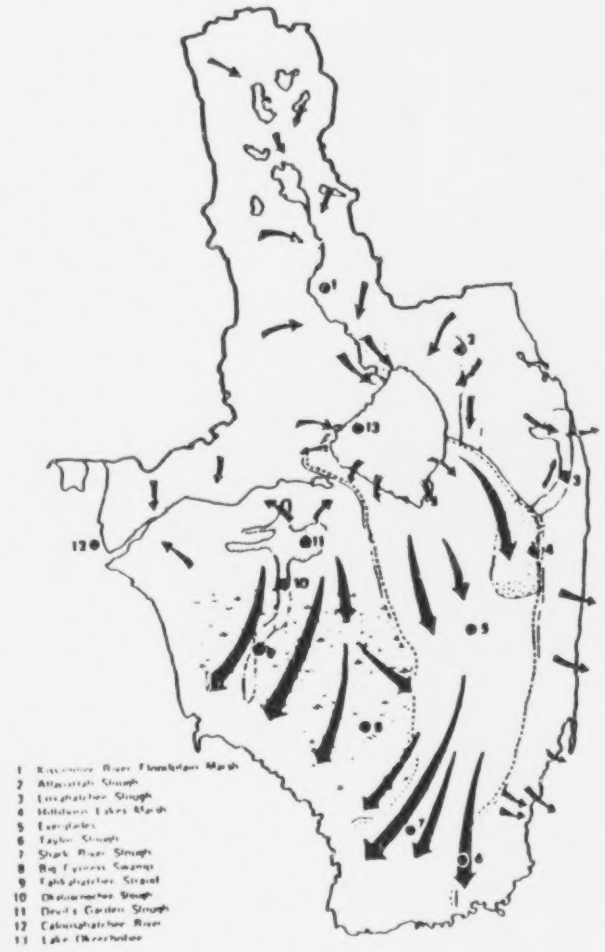
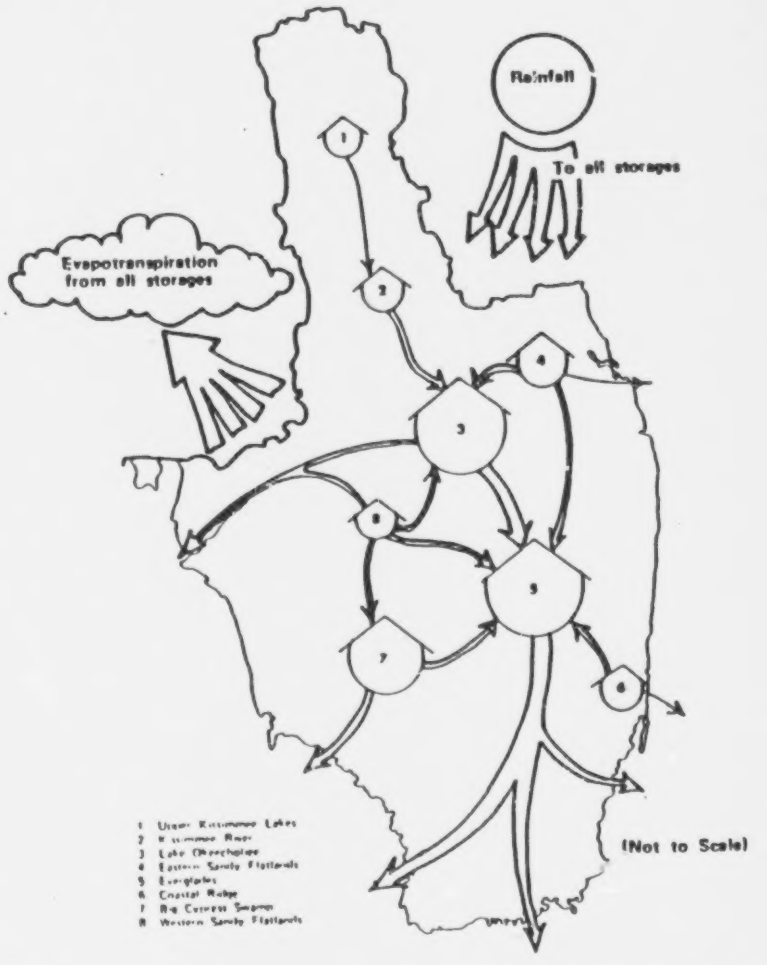


Figure 4. NORMAL HYDROPERIOD AND MAXIMUM WATER DEPTHS IN BIG CYPRESS HABITATS[5]

FIGURE 5. Surface Water Flow Patterns Including Prominent Flow Ways and Storage Areas in Primitive South Florida. 6



(a) Map of surface water movements and storage areas



(b) Hydrologic model of surface water movements and storage areas

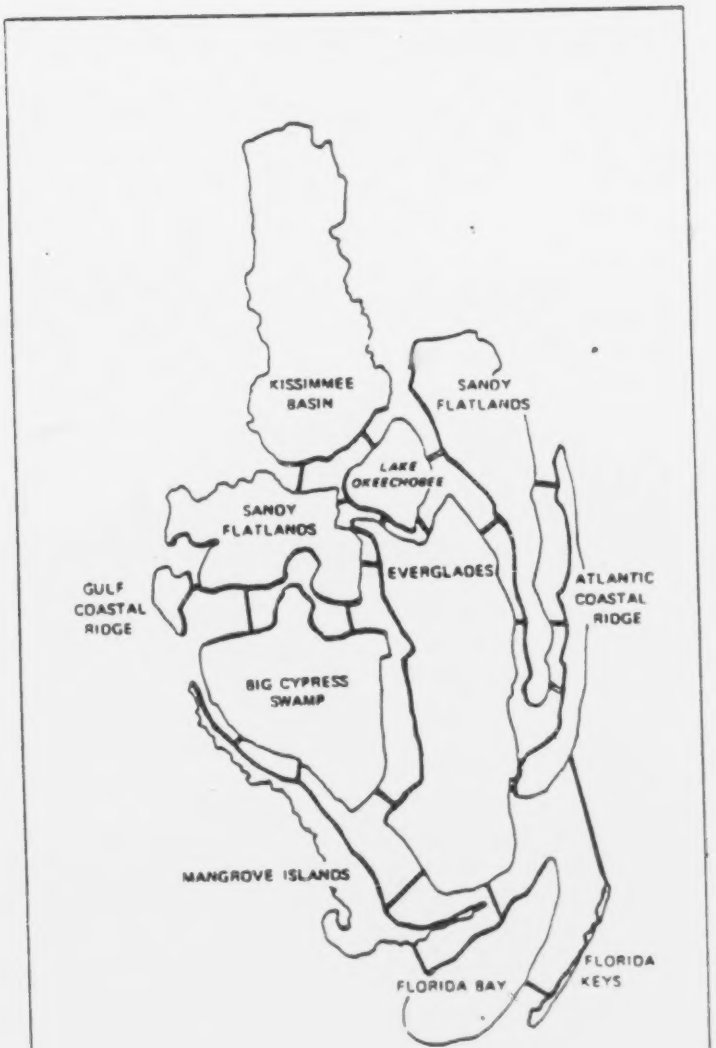


FIGURE 6 Physiographic Subregions of Primitive South Florida Linked by Flows of Water.[7]

after the rains have stopped. (See Figure 7.) The wet season is thus effectively extended.

The headwaters of this sytem is in the upper Kissimmee chain of lakes, beginning just South of Orlando. When the rainy season came, under natural, predevelopment conditions, these lakes would fill and then overflow into the Kissimmee River, which, during dry periods, was a small, winding stream discharging into Lake Okeechobee. The Kissimmee would expand into a wide, shallow floodplain and the waters would move southward through extensive marshes. The rate of discharge into the lake was thus retarded and it was protected from excessive nutrients by the assimilative capacity of the wetland plants and bacteria.

Lake Okeechobee, in turn, overflowed into the Everglades, and, to a lesser extent, into the headwaters of the Caloosahatchee River. The Everglades has been called a River of Grass. Sawgrass marshes and deeper sloughs, dotted with islands of hammock vegetation, extended from Lake Okeechobee to Florida Bay. The marsh vegetation retarded the slow, shallow, almost imperceptible movement of water to the South. Rainfall over the Everglades maintained the flow against evapotranspirative losses. Extensive deposits of peat, formed from the accumulation and decay of vegetation under water, acted as a sponge, holding the water table at elevated levels into the dry season and helping to maintain the head of fresh water. This head of fresh water

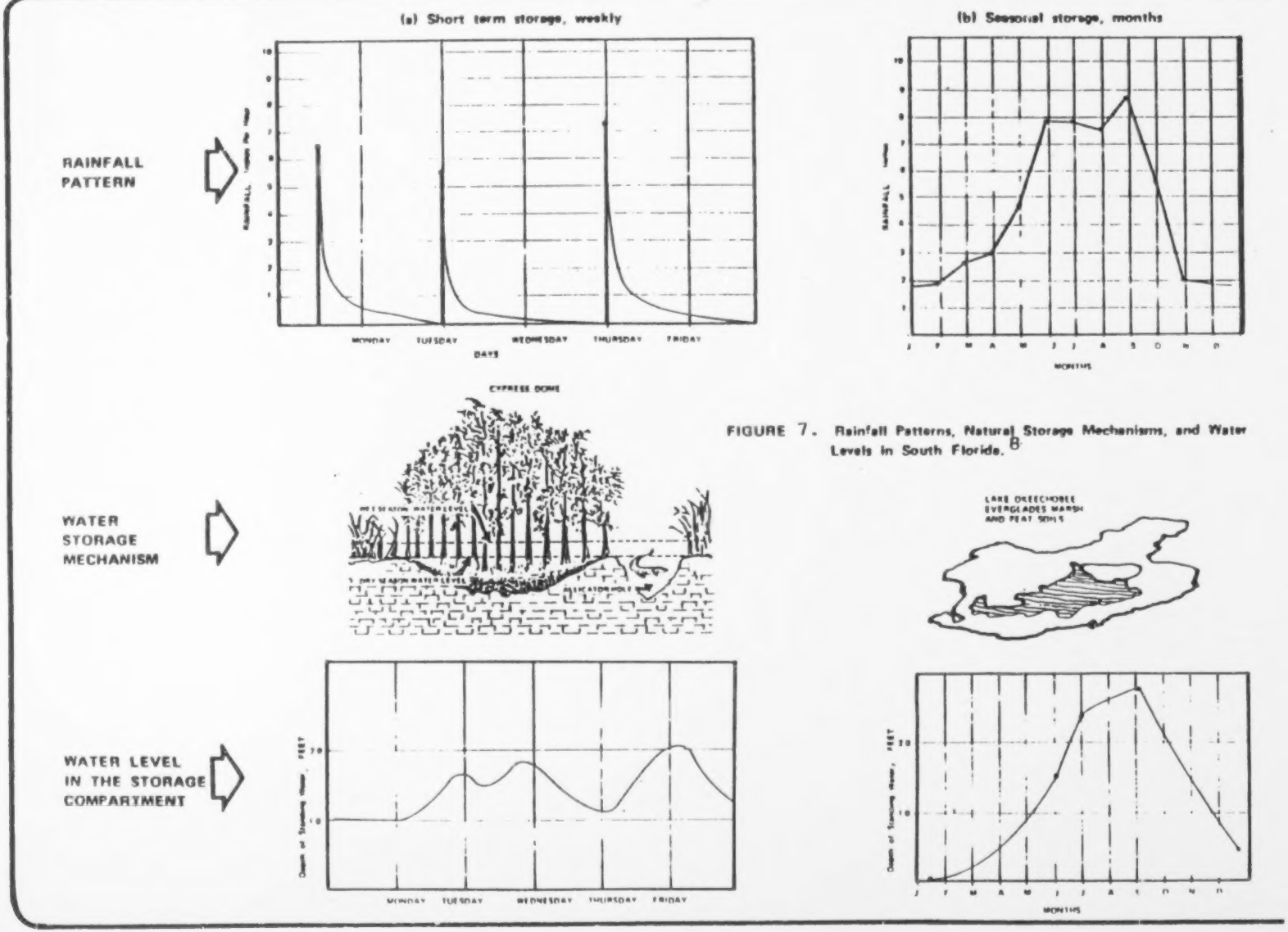
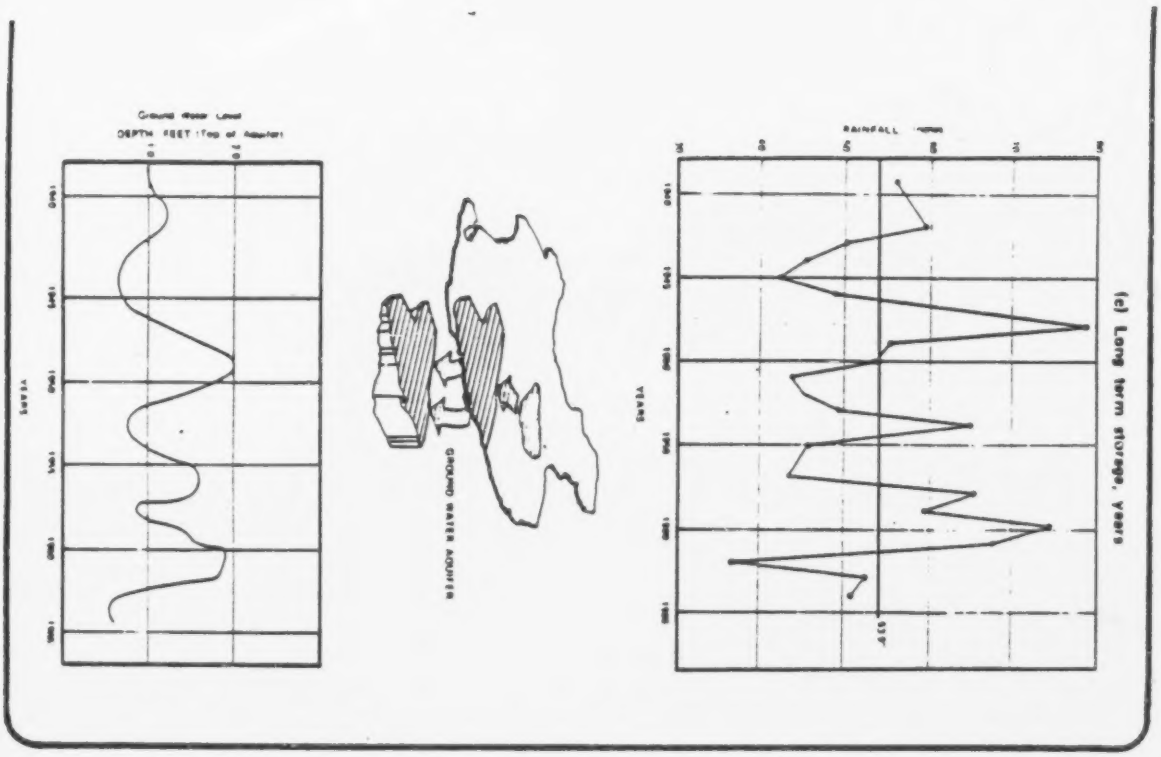


FIGURE 7. Rainfall Patterns, Natural Storage Mechanisms, and Water Levels in South Florida.[8]

Figure 7 continued



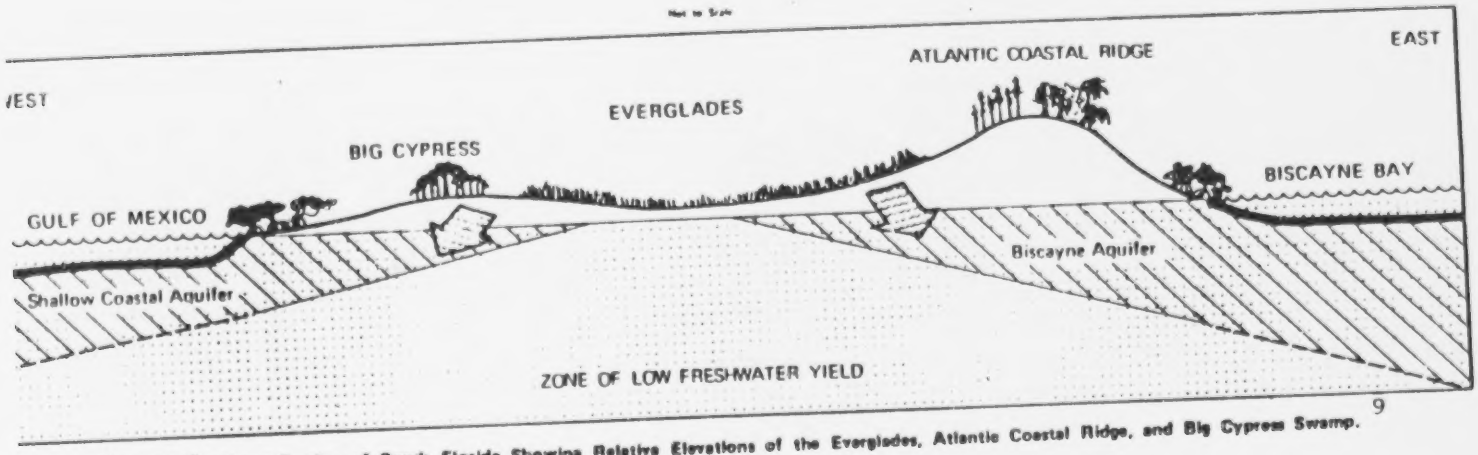


Figure 8. Cross Section of South Florida Showing Relative Elevations of the Everglades, Atlantic Coastal Ridge, and Big Cypress Swamp.

recharged the Biscayne Aquifer on the East and a shallow, less productive coastal aquifer on the West. (See Figure 8.)

The Biscayne Aquifer is one of the most productive in the world.[10] It consists of extremely porous limestone extending like a wedge from the East Everglades, where it is only a few feet thick, to the coast, where it may be 100 to 400 feet thick. It extends under 3,000 square miles of Dade and Broward Counties. Impermeable layers beneath the Biscayne Aquifer separate it from deeper saline waters. Along the coastal edge, however, salt water is held back only by the pressure of the fresh water head. Each foot of fresh water above sea level presses the sea water down 40 feet.[11] A two foot head of fresh water, for example, can maintain an 80 foot thick bubble of fresh water against the upward and intrusive presure of the sea. The Everglades maintained such pressure in the Biscayne Aquifer that early pioneers drove a pipe into the floor of Biscayne Bay off Coconut Grove and sailing ships filled their casks with fresh water bubbling from the top.[12]

To the West of the Everglades is the Big Cypress Swamp.[13] The Big Cypress is a complex mosaic of pinelands, prairies, and cypress swamps, all differentiated from each other by slight variations in elevation and, consequently, in hydroperiod. Water tends to flow out of the area through long strands of cypress, the largest of which is the Fahkahatchee Strand, which connects in turn to the Okoalacoochee Slough. Water also collects in more isolated depressions fringed with cypress trees called cypress domes. These areas of deeper water serve as dry season reser-

voirs of fish, crustaceans, otter, water fowl and other life. During the wet season, water (and aquatic life) overflows the cypress areas, extending as sheet flow over grassy prairies and, for shorter periods of time, over pinelands.

Water from both the Everglades and the Big Cypress eventually reaches the sea and a fringing band of mangrove forests. Here the mixture of fresh and salt water creates an enormously productive estuary. Many species of marine life depend on brackish estuarine waters for nursery grounds. Pink shrimp, for example, spawn near the Dry Tortugas, west of Key West. The larvae are carried by currents to the coastal estuaries. Fresh water moving in from the interior wetlands creates brackish conditions that are unfavorable to predators of the larval shrimp, which grow to maturity, return to sea and renew the cycle. Juvenile snook are another species that must have these conditions for early growth and survival. 85% of the commercial species harvested from the Gulf of Mexico depend on estuarine conditions.

In addition, the coastal wetland vegetation provides a vital source of nutrients to marine life. Mangrove leaves and other organic debris falling into the water is decomposed by bacteria. Bacteria covering the detritus significantly enrich its food value. Small crustaceans and fish ingest this rich detritus and are in turn consumed by larger species, forming a food chain that extends from the mangrove forests to the open sea. In addition, the detritus itself moves by tidal action to more open waters, where it is consumed. The contribution of red mangroves, which grow in areas that are frequently inundated by the tides, to the

production of organic detritus was first recognized in 1969.[14] More recent investigations have demonstrated the importance of black mangroves, which are inundated infrequently and are above mean high water.[15] Salt marsh grasses play a similar role.[16]

II. Historic Wetlands Conversion

Prior to 1900 this vast hydrologic system was relatively intact. Upon entering the Union, the State of Florida became vested with title to all submerged lands beneath navigable waters.[17] An additional 500,000 acres was granted for the purpose of internal improvement. Then, by virtue of the Swamp Lands Act of 1850,[18] the State received all federal lands that were "unfit for cultivation due to its swampy or overflowed condition"--about 20 million acres. Proceeds from sale of the lands was to be used to finance drainage works.

The belief that South Florida could be easily converted into a new Garden of Eden was prevalent during that period.[19] An attorney from St. Augustine, Buckingham Smith, had been commissioned to survey the Everglades. His report concluded that drainage could be readily accomplished and the land reclaimed for the profitable cultivation of coffee, sugar, lemons, limes, oranges, bananas, plantains, figs, cotton, corn, rice and tobacco.[20] General William S. Harney suggested that 100,000 people would move into the region within five years if it were drained.[21]

The first great attempt to drain South Florida was undertaken by Hamilton Disston, a wealthy industrialist from Philadelphia, who purchased four million acres of land in 1881 for one million dollars. Disston succeeded only in opening the Kissimmee for navigation, however, and cutting a channel from Lake Okeechobee to the Caloosahatchee River, but he began the process of lowering water levels. Completion of the project was left to a series of

drainage districts established by authority of the state and given power to tax, condemn land and construct levees, canals and other works. The giant Everglades Drainage District was created in 1907. By 1929 it had dredged several canals from the coastal ridge to Lake Okeechobee, dramatically lowering water levels. Levees were erected along the south rim of the lake and cultivation of the peat began. At about the same time, roads and canals were constructed across the Everglades and Big Cypress Swamp from Miami to Naples (Tamiami Trail) and from Everglades City to Immokalee (SR 29), contributing to the drainage. Along Biscayne Bay a new type of land development was pioneered. By dredging the bottom of the bay and depositing the fill on tidal flats and mangrove swamps, Carl Fisher turned the narrow swampy barrier island that was Miami Beach into valuable real estate. The practice proved so profitable that the natural contours of North Biscayne were soon obliterated and the practice spread along the coast.

Tragedy soon resulted from drainage of the Everglades. Floods struck in 1926 and 1928 causing extensive property damage and loss of life. Twelve feet of hurricane-driven water overtopped the Okeechobee dikes in 1928 and killed more than 2,000 people. Drought during the 1930s caused disaster of another sort. The peat soils (muck) of the Everglades began to be lost. It had taken thousands of years for the peat to form. Now, because the canals had lowered water levels, the peat would sometimes catch fire and burn for months, creating a dense pall of smoke over the coastal towns. Where the peat did not burn, it

slowly oxidized, at rates of up to a foot per decade. Although improved water management had slowed this process, much of the peat has been lost and soil subsidence is continuing. Residents of the East Coast began to notice another effect of lowered water levels at about this time--their wells began to draw salty water and had to be moved further inland, another process that continues to this day. Then, in 1947, the floods returned. Miami received 8.5 feet of rainfall that year (102 inches) and extensive property damage resulted. The system was clearly inadequate.

The solution proposed in 1948 launched a new phase in South Florida water management. The Central and Southern Florida Flood Control District was created and charged with the multiple objectives of preventing flooding, preventing salt water intrusion, maintaining navigation, protecting fish and wildlife, and providing water supplies. A massive public works project was the vehicle for accomplishing these ends. New levees were constructed around Lake Okeechobee and portions of the Everglades were diked off to form Conservation Areas. Massive pumping stations were installed to move water from the agricultural areas into the lake or the conservation areas for storage and subsequent release during dry periods. Various canals were improved and new canals were dug. Control stuctures gave water managers the ability to quickly release water to the sea when threatened with flooding or to retain it for use during droughts. Barriers

were installed in canals leading to the ocean to block the intrusion of salt water.

By the 1960s most of the major drainage projects that exist today had been completed, with several exceptions. (See Figures 9 & 10.) Alligator Alley (SR 84) was completed between Naples and Ft. Lauderdale in 1967, largely paralleling the route of the Tamiami Trail (US 41). The roadbed acts as a dike, significantly disrupting the normal flow of surface waters. It also gave easy access to inaccessible wilderness areas. A massive land development project, Golden Gate Estates, was then begun in the Big Cypress Swamp just West of the Fahkahatchee Strand. By the time it went bankrupt, in the early 1970s, hundreds of miles of roads and canals had been constructed in a fragile wetland ecosystem, lowering water levels dramatically and causing massive environmental damage. A third project completed during that time was the channelization of the Kissimmee River. The meandering 90 mile Kissimmee was transformed into a 52 mile ditch (C-38), draining the floodplain marshes of the river and upper lakes. Fish and wildlife resources were decimated and substantial water quality problems developed, leading to overenrichment of Lake Okeechobee. A fourth major project, the infamous Jetport and associated development, was only partially completed. The Metropolitan Dade County Port Authority had planned to construct a new regional airport in the Big Cypress Swamp. Because of the enormous potential for environmental damage resulting from an access corridor, aircraft operations, and the commercial development that typically accompanies a major airport, national

FIGURE 9. Major Water Control Structures in South Florida.

(a) Constructed before 1900

PURPOSE:
Navigation Drainage

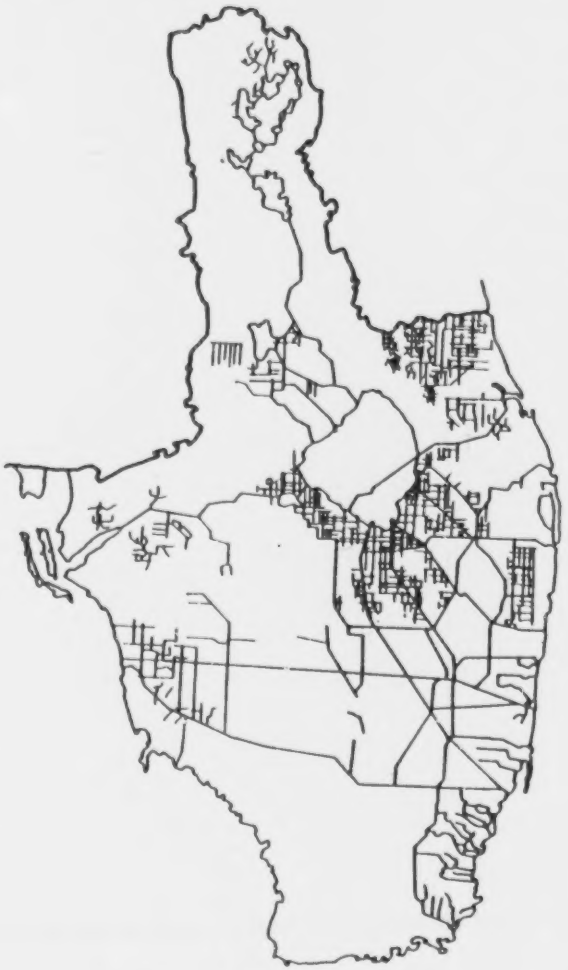
(b) Constructed between 1900 and 1953

PURPOSE:
Drainage

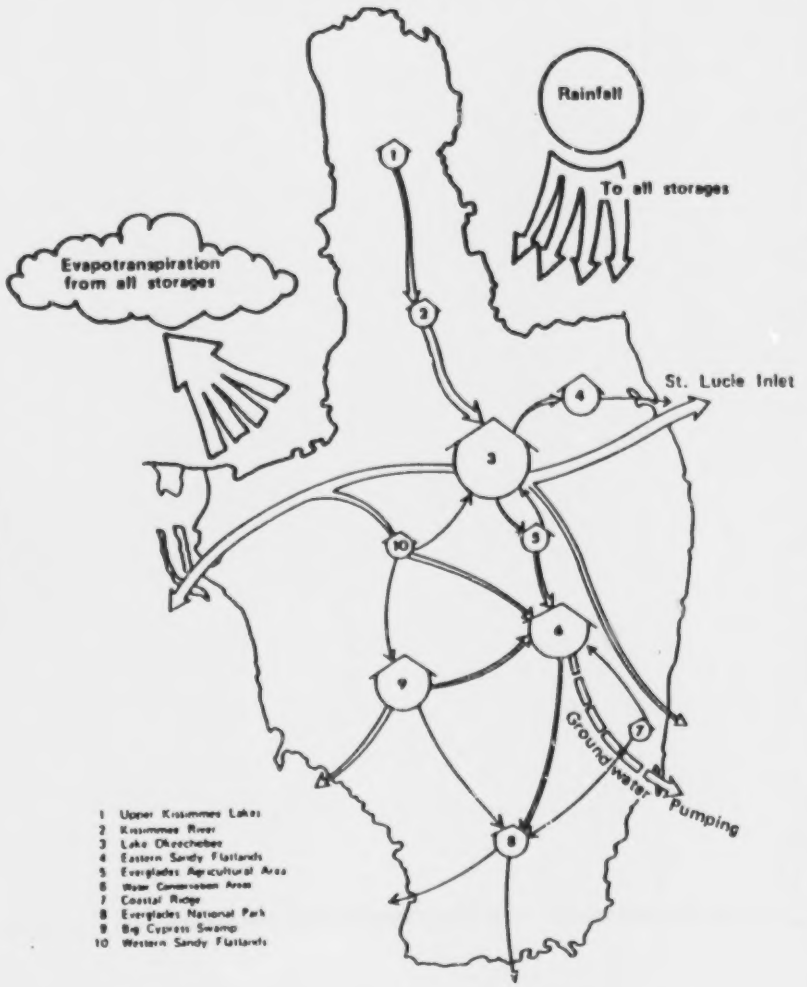
(c) Constructed between 1953 and 1973

PURPOSE:
Flood Control, Water Supply, Drainage

FIGURE 10. Major Control Structures, Storages, and Flow Patterns of Present South Florida. (Not to Scale)



(a) Map of control structures and storage areas



(b) Hydrologic model of surface water movements and storage areas

attention was focused on South Florida. A compromise allowed construction and operation of a limited training facility pending selection of an alternate site. This heightened level of concern led to funding of significant scientific studies that form the basis for our understanding of the South Florida environment.

III. The Resulting Loss of Wetlands

South Florida has experienced an enormous loss of wetlands in the last 100 years. Every wetland in the region has been affected to some extent by drainage activities that have lowered water levels over the entire area. Water levels in the Everglades have been lowered 6 feet in places. Much of the urban and agricultural develoment occurring in the region is located in former wetlands that have been drained or filled.

The Center for Wetlands at the Universtiy of Florida has conducted a comprehensive assessment of the land use and ecosystem changes that occurred in South Florida between 1900 and 1973. The status of the system in 1900, 1953 and 1973 was depicted in three regional maps. A table summarizing the results is reproduced below. (Table 1.) By 1973, 40% of the region's wetlands had been drained or filled and converted to other uses. The acreage loss for various types of wetlands, as of 1973, is as follows:

Wetland Type	Acreage Lost
rivers and lakes	40,555
cypress domes & stands	116,581
wet prairies	950,377
scrub cypress	45,940
fresh water marshes and sloughs	186,368
sawgrass marshes	668,109
saline transitions	3,399
scrub mangroves	2,206
salt water marshes	121 (increase)
mangroves	14,077

Although more recent regional data regarding wetland losses is not available, the conversion of wetlands to other uses is definitely continuing, though at a reduced rate and through

TABLE 1

Land Use and Ecosystem Areas in South Florida: 1900, 1953, and 1973
(From 1900, 1953, and 1973 Land Use Maps)

Sub-System Number	Description	1900 Area, Acres	1900 % of Total	1953 Area, Acres	1953 % of Total	1973 Area, Acres	1973 % of Total
	URBAN						
1	Cleared land			35,156	0.3	172,736	1.5
2	Lakes & Reservoirs (man made)			1,023	< 0.1	3,262	< 0.1
3	Recreation/Open space			8,734	0.1	56,461	0.5
4	Residential, light			43,034	0.4	64,415	0.6
5	Residential, medium/dense			89,617	0.8	427,316	3.8
6	Commercial & Industrial			8,433	0.1	57,819	0.5
7	Transportation			25,095	0.2	24,000	0.2
8	Power Plants			--	--	4,090	< 0.1
	AGRICULTURE						
9	Improved pasture			307,886	2.7	1,644,782	14.6
10	Vegetable crops			273,268	2.4	321,306	2.9
11	Tree crops			189,986	1.7	414,333	3.7
12	Sugarcane			178,868	1.6	515,273	4.6
	NATURAL						
	Uplands						
13	Grassy scrub systems	807,140	7.1	1,332,190	11.8	734,227	6.5
14	Pineland systems	2,486,770	22.0	1,357,188	12.0	934,957	8.3
15	Hardwood systems	442,727	3.9	431,308	3.8	396,960	3.5
	Subtotal	3,736,637	33.0	3,120,686	27.6	2,066,144	18.3
	Wetlands						
16	Rivers & lakes	633,139	5.6	615,497	5.4	592,584	5.2
17	Cypress domes & stands	472,904	4.2	412,613	3.7	356,323	3.1
18	Wet prairies	2,111,623	18.7	1,772,204	15.7	1,161,246	10.3
19	Scrub cypress	390,563	3.5	391,429	3.5	344,623	3.0
20	Fresh water marshes/sloughs	1,279,274	11.3	1,412,022	12.5	1,092,906	9.7
21	Sawgrass marshes	1,291,942	11.4	1,028,522	9.1	623,833	5.5
	Subtotal	6,179,445	54.7	5,632,287	49.9	4,171,515	36.8
	Coastal						
22	Beach & dune systems	30,454	0.3	22,043	0.2	23,593	0.2
23	Saline transition	4,536	< 0.1	< 5,671	0.1	1,137	< 0.1
24	Scrub mangroves	13,512	0.2	17,145	0.2	11,306	0.1
25	Salt water marshes	100,032	0.9	102,771	0.9	100,153	0.9
26	Mangroves	603,517	5.3	608,275	5.4	589,440	5.2
	Subtotal	752,051	6.7	755,905	6.8	725,629	6.5
27-35	Estuarine/Marine Systems	637,325	5.6	636,508	5.6	637,405	5.6
	SUMMARY						
	Urban	0	0.0	211,092	1.9	810,099	7.2
	Agriculture	0	0.0	950,008	8.4	2,895,695	25.7
	Natural	11,305,269	100.0	10,145,386	89.8	7,550,232	67.1
	Natural (without Estuarine/Marine)	10,667,944	94.4	9,508,878	84.1	6,912,827	61.4
	TOTAL AREA	11,305,269	100.0	11,306,486	100.0	11,306,486	100.0

smaller projects than in previous decades. Recent data compliled by the U.S. Fish and Wildlife Service, National Wetland Inventory and the Soil Conservation Service for Palm Beach County may be indicative of regional trends.[25] The study covered the period from 1972 to 1980. During those eight years, 23,767 acres of wetlands were converted to agricultural use, while 655 acres were urbanized. During that same period, 24,539 acres of agricultural lands were lost to urbanization. It appears then that urbanization displaces agriculture, which then moves into wetland areas.

IV. The Consequences of Wetlands Conversion

Over forty percent of the original wetlands in South Florida have been converted to other uses, primarily by drainage. This conversion has facilitated unprecedented agricultural, commercial and residential growth. Since 1900, the population has increased to about 4.5 million people.[26] About 1.6 billion dollars worth of agricultural products were produced in the region in 1980.[27] In 1981 real property was assessed for taxation in the region at a value of 104 billion dollars.[28] Growth is projected to continue at a high rate. The Bureau of Economic and Business Research at the University of Florida predicts as many as 7 million people may inhabit the region in 2010. (See Figure 11.)

Serious concern exists, however, regarding the ability of the region to continue these rates of growth without the natural functions provided by wetlands.[29] Water, in particular, may be a limiting factor and wetlands are a key component of the systems that store, convey and purify the region's water supply. The population of the area and continued agricultural productivity both depend on wetlands for maintenance of the water supply. Further, many of the amenities of a beautiful, natural setting that attract people to the area--clean, abundant water, fish and wildlife--depend on wetlands. The remainder of this section will discuss the general consequences of wetland loss in South Florida.

1. Loss of Storage

Wetlands store surface waters in South Florida. Loss of

FIGURE 11.
POPULATION PROJECTIONS

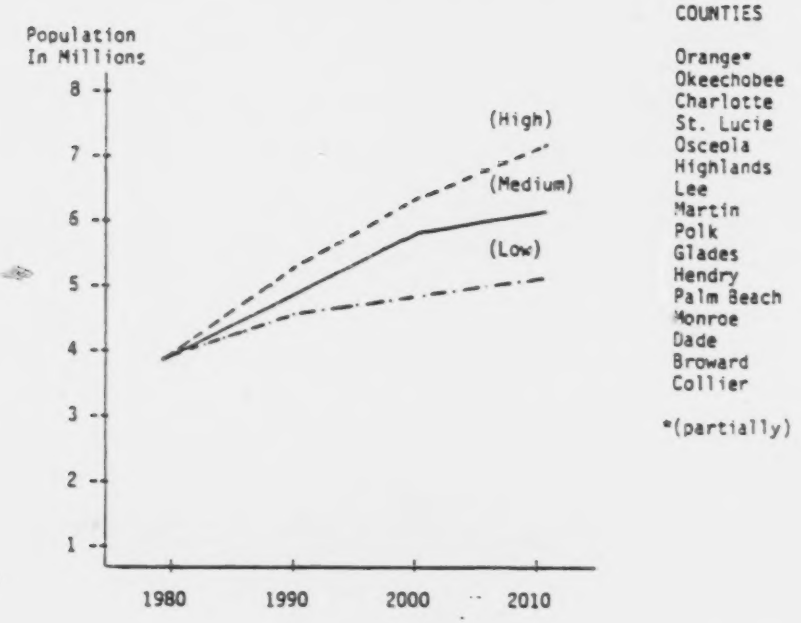


Figure 12. Water Use Projections.

LAKE OKEECHOBEE PLANNING AREA

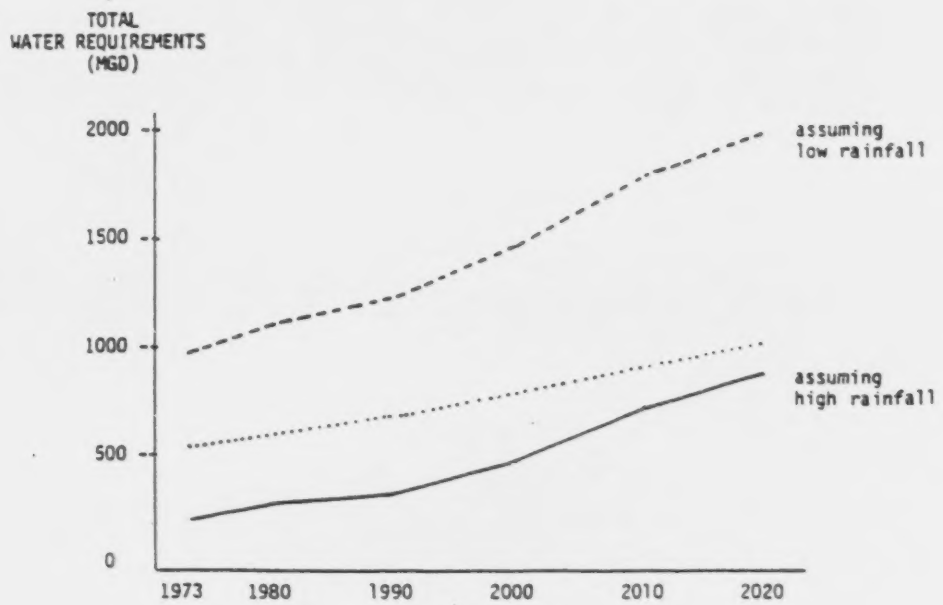
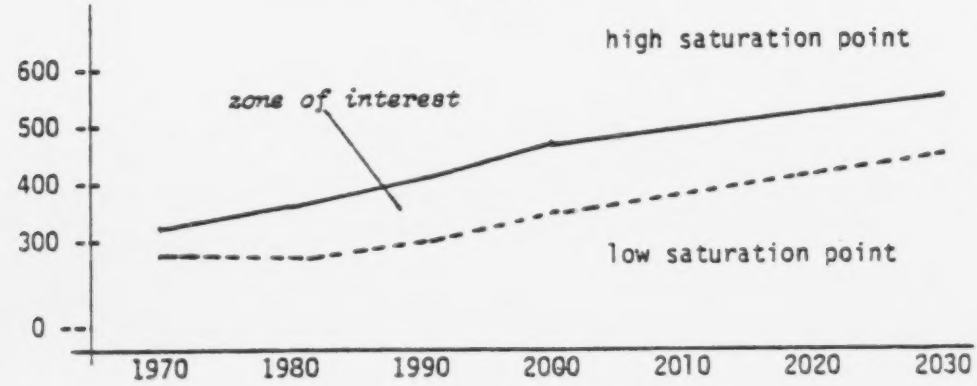


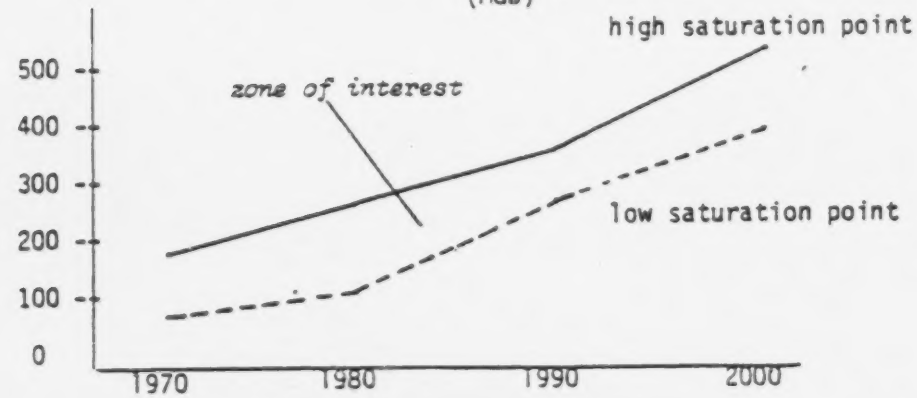
Figure 12 continued

Lower East Coast

Dade County Water Requirements
(MGD)



Broward County Water Requirements
(MGD)



Palm Beach County Water Requirements
(MGD)

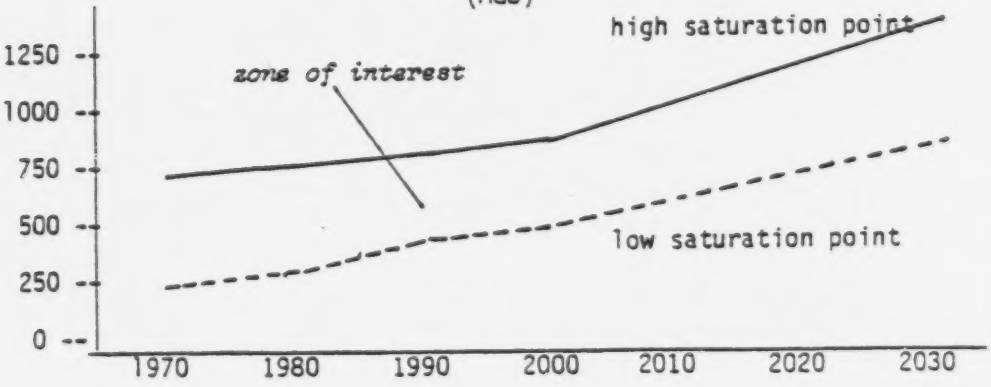
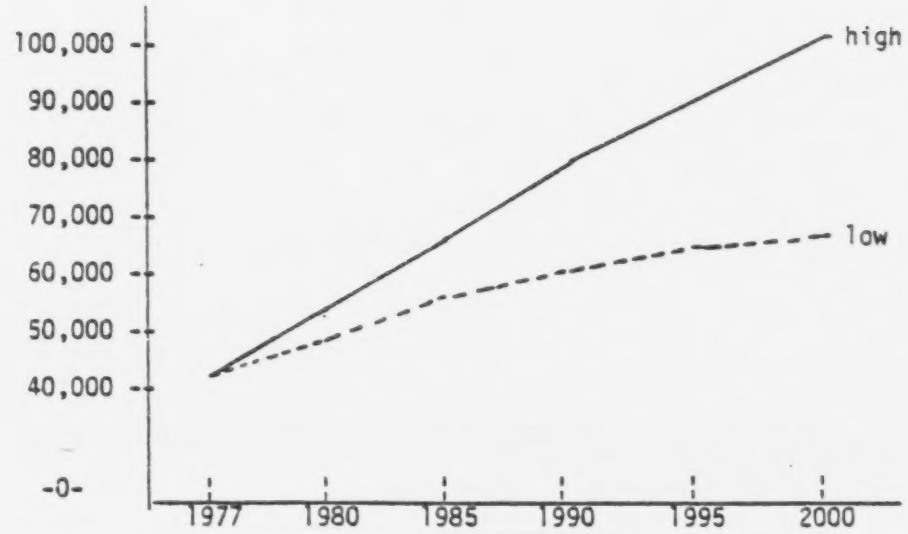


Figure 12 continued

Lower West Coast: Counties Charlotte, Collier, Glades, Henry, Lee

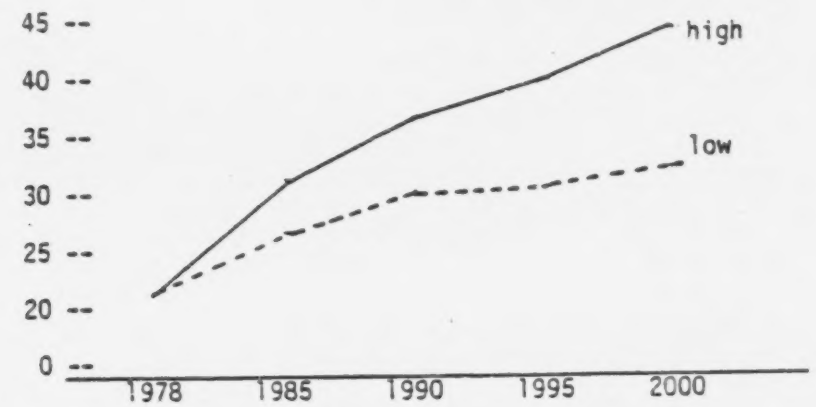
WATER DEMAND FORECAST[1]



[1]Includes all residential, commerical and industrial demand supplied by water utilities but not industrial self-supplied.

Upper East Coast: Counties St. Lucie, Okeechobee (partial) Martin

NON AGRICULTURAL WATER DEMAND
(MGD)



wetlands generally results in a loss of storage capacity. There is no other place for water to go, except through canals to the sea, where it is lost for subsequent use. In fact, much of the rainfall South Florida receives is discharged to salt water because the wetland areas that would have provided storage have been converted to agricultural and urban uses that would be flooded if the water were retained. Less water is then available for use during the dry season. The loss of water storage capacity is of particular concern in view of the rising demand for consumptive use of water reflected in Figure 12.

2. Loss of Organic Soils

The lowering of water levels and resulting loss of wetlands has resulted in a widespread subsidence of organic soils. Much of the Everglades was originally underlain by thick beds of peat, formed by the deposition and partial decomposition under water of wetland vegetation. Lowering of water levels exposed the peat to air, and it began to oxidize. In many places, the peat has caught fire and burned. Close to Lake Okeechobee, where the peat had been 12 to 14 feet thick in 1912, it had subsided to 7 or 8 feet by 1940.[32]

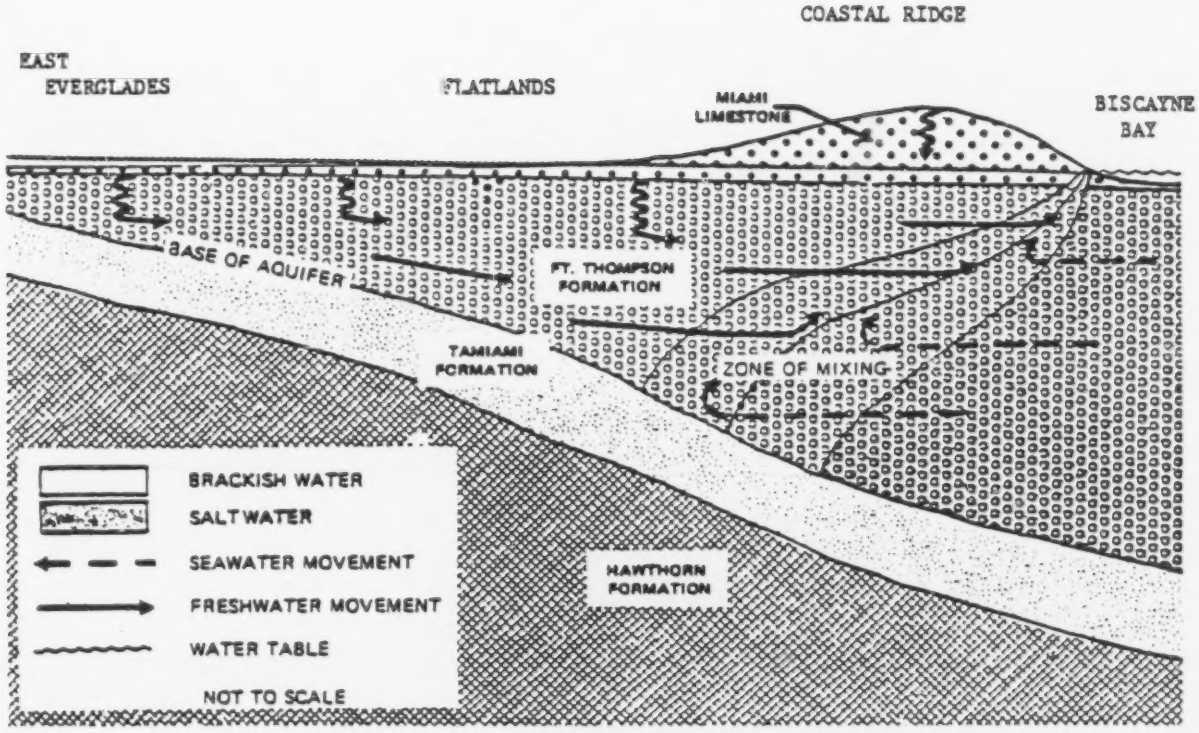
The loss of organic soils is important not only because of the loss of potential agricultural productivity, but because the peat acts as a natural sponge, holding water at higher levels than it would otherwise reach as surface water. An inch of rainfall will raise the water table half a foot in the peat. Because salt water intrusion is checked by the hydrostatic pressure of a head of fresh water, anything that raises the water table decreases the extent of salt water intrusion.

3. Salt Water Intrusion

Salt water intrusion has been a major problem in South Florida. When water levels were lowered by draining interior wetlands, salt water was able to move up the canals during dry periods. Salt water, which is slightly heavier than fresh water, extends like a wedge under a layer of fresh water along the coast. Figure 13 illustrates the relationship. The salt water is kept from rising and intruding into the aquifer by the pressure of fresh water. Theoretically, each foot of fresh water above sea level has sufficient weight to push the salt water down 40 feet. Conversely, if the fresh water levels are drawn down a foot, the underlying salt water can rise into the aquifer 40 feet. The actual ratio may be less than 40:1 due to hydraulic resistance of the aquifer. Where canals have been dug to tidewater, the salt water can intrude most easily. As water levels have been lowered by the drainage of interior wetlands and consumption of fresh water, South Florida has suffered progressive salt water intrusion. Figure 14 shows the intrusion. By 1925, a City of Miami well field 1.5 miles from the Bay had to be abandoned because of salting.[33] The well fields were moved further from the ocean and then abandoned again in the 1940s. More recently, in July, 1982, the Homestead Air Force Base was forced to move its well field fur'her from the ocean because the water had become too salty.[34] Metro-Dade County is planning to locate the next well field almost at the edge of the Conservation Areas.

4. Fire

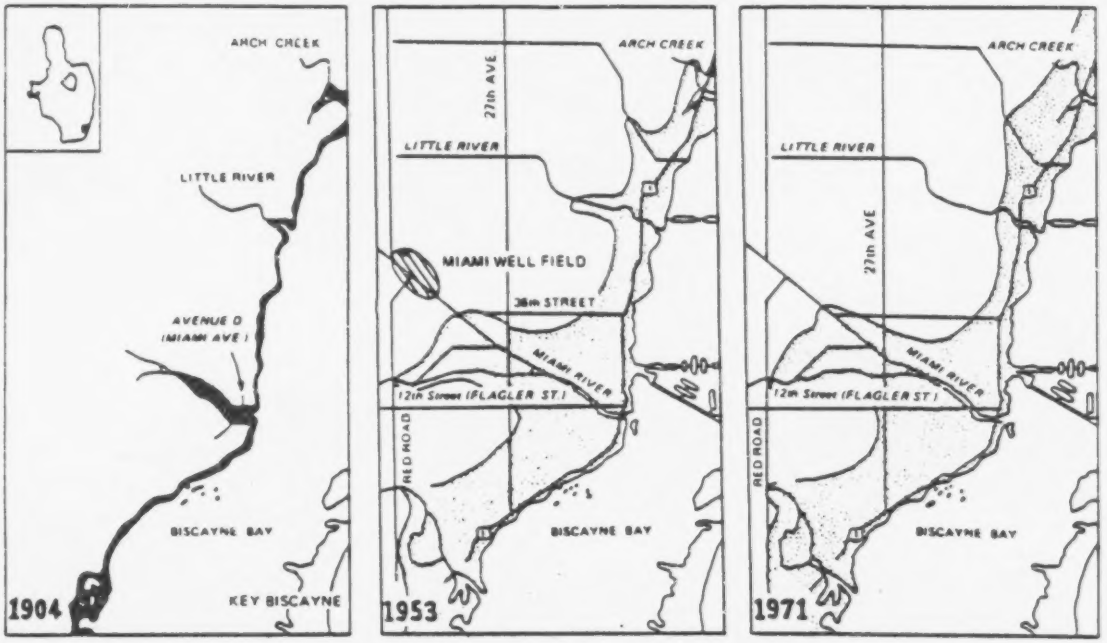
The drainage of wetlands in South Florida has dramatically



GENERALIZED CROSS SECTION OF DADE COUNTY (Not to Scale)
WATER MOVEMENT IN THE BISCAYNE AQUIFER [35]

FIGURE 13

FIGURE 14 - Gradual Penetration of Salt Water into the Biscayne Aquifer.[36]



increased the incidence and damaging intensity of fires. Fires are natural to the South Florida environment and the plant and animal species of the region are well-adapted to it. Fire maintains open stands of pine and palmetto, sawgrass and wet prairie habitat. But fire is destructive of tropical hammocks, deep cypress sloughs and peat soils. Lowering of water levels allows fire to reach these resources much more frequently than it would under natural conditions, with all of the attendant destruction.

5. Flooding

Wetlands are, by their nature, subject to frequent flooding. As the flooding of the late 1920s and 1940s demonstrated, drainage works that make land livable and workable during dry or normal years do not necessarily protect against flooding during wet years. Structural works to provide flood protection by increasing the capacity of the drainage canals are extraordinarily expensive and frequently exacerbate the water supply problems described above.

6. Degradation of Water Quality

Wetlands and associated sheet flow systems of South Florida maintain water quality by assimilating and reducing nutrients in the water column flowing through them. The destruction of these areas and diversion of surface water into canals and other deep water bodies leads to significant changes in water quality. Because there is less exposure of the water column to the action of sunlight and biologically active surface areas are reduced, the level of nutrients increases. Suspended solids are easily

transported by the more rapidly moving waters of canal systems. These problems are magnified by the introduction of pollutants from the land uses for which the wetlands are converted. Discharge of wastes such as sewage is an obvious problem but urban runoff also carries heavy loadings of oil, heavy metals, pesticides, nutrients and suspended solids. Drainage from cultivated fields, improved pastures and other agricultural operations carries manure, fertilizers, pesticides and other pollutants into surface waters. Many experts believe, in fact, that surface runoff from converted lands is a greater contributor to water quality degradation in South Florida than the actual dredging or filling of wetland areas.

7. Loss of Fish and Wildlife Habitat

Wetlands are a vital habitat in South Florida for fish and wildlife. Elimination of habitat, of course, reduces populations. More subtle changes can also have a large effect. The alternate flooding and drying of the area is a key to the existence of many species. When extensive areas are inundated, there is enormous production of such aquatic foods as minnows, snails and crayfish. Subsequent drying concentrates these foods in deeper sloughs and water bodies where larger fish, alligators, otters, wading birds and other predators can feed. The life cycle of many species is tied to this seasonal cycle. Wood storks, for example, are unable to successfully fledge their young without the dry season concentration of food. Anything that interferes with the cycle--too much water in the dry season or not enough during the wet season--tends to reduce fish and

wildlife populations. Populations of alligators, wading birds, eagles, and other species have declined throughout the area in response to loss of wetlands.[37]

The disruption of natural water levels has also led to the invasion of exotic vegetation such as Malaleuca trees into wetland areas. Malaleuca forms dense stands that are virtually useless for wildlife. Malaleuca, which comes from a region of monsoon climate, is well adapted to alternating flood and drought conditions. As wetlands in South Florida have been subjected to more prolonged, severe periods of dryness, Malaleuca has proliferated. Malaleuca may, in fact, help to perpetuate favorable conditions for itself. Areas of Malaleuca have much higher evapotranspiration rates than native marsh. Early promoters of development in the Everglades who knew this fact deliberately spread the tree in an attempt to dry the land. It has proved difficult to eradicate. Malaleuca resists fire with an insulating bark and sprouts readily from rootstock. Maintenance of normal hydroperiods seems to be the only effective control.

8. Reduction of Estuarine Productivity

Estuarine productivity is greatly reduced in South Florida by the loss of wetlands. Elimination of mangroves reduces the contribution of organic detritus to the system, thus reducing the populations of marine life that are dependent on this food source. Disruption of estuarine salinity, caused by the diversion of surface flows from wetlands to canal systems, is also a major cause of estuarine degradation. Pulse discharges of fresh water to estuaries, rather than slower infusions through the

wetland fringe, disrupt aquatic organisms that are not well-adapted to rapid shifts between saline and fresh water conditions.[38] In addition, rapid drainage depletes the supply of water available to maintain brackish conditions into the dry season.

9. Modification of Climate

Drainage of large expanses of wetlands may affect regional climate. Large water bodies, for example, help to prevent damaging frost. Drainage of the Everglades may have increased frost damage.[39] Another effect that is currently being considered is the possibility that elimination of wetlands could reduce local summer thunderstorm activity by reducing evapotranspiration that serves to trigger the release of moisture from clouds moving inland from the sea.[40] By this hypothesis, loss of wetlands would contribute to regional rainfall deficits.

V. Constraints on Wetlands Conversion

Several federal, state, regional and local agencies currently participate in the regulation of wetlands conversion in South Florida. The Army Corps of Engineers administers Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act. The Florida Department of Environmental Regulation regulates dredge and fill pursuant to Chapters 403 and 253, Florida Statutes. The South Florida Water Management District regulates surface water management structures pursuant to Part IV of Chpater 373, Florida Statutes. Local governments regulate wetlands use to varying degrees. There is surprisingly little overlap in these regulatory programs, however, due to differences in jurisdiction, regulatory concerns and relative effectiveness.

A. Regulation by The Corps of Engineers

The U.S. Army Corps of Engineers regulates wetlands use under authority of two statutes. Section 10 of the Rivers and Harbors Act of 1899[41] gives the Corps authority to regulate dredging, filling and other activities in navigable waters. The traditional common law definition of navigable waters limits Corps jurisdiciton under Section 10. The term "navigable waters" traditionally meant those waters either presently used for commercial navigation, used in the past for commercial navigation, susceptible to use for commercial navigation by reasonable improvements or subject to the ebb and flow of the tide. This Act remains a viable piece of legislation and, as such, is used by the Corps to regulate discharge of fill below ordinary high

water on navigable fresh waters and below mean high water on coastal water bodies.

Section 404 of the Federal Water Pollution Control Act Amendments of 1972[42] gives the Corps additional authority over the discharge of fill into wetlands.[43] Section 404 requires the Corps to regulate the discharge of fill into navigable waters, but, extending jurisdiction beyond the limits of Section 10, defines navigable waters as all waters of the United States.[44] The overriding objective of the Act is maintenance and restoration of "the chemical, physical and biological integrity of the Nation's waters."[45] Jurisdiction over filling of those waters was therefore extended to the limits permissible under the Commerce Clause.[46]

1. Lands Subject to Jurisdiction

There was some initial confusion over the scope of Section 404 jurisdiction, with the Corps refusing to regulate beyond the scope of traditional navigable waters. In NRDC v. Callaway,[47] though, the District Court for the District of Columbia, ordered the Corps to extend jurisdiction to the limits of the statutory jurisdiction.

Subsequent regulations adopted by the Corps to implement the Act provided for a phased extension of jurisdiction.[48] Phase I encompassed traditional navigable waters and adjacent wetlands and was effective immediately. Phase II, effective September 1, 1976, added primary tributaries to Phase I waters and lakes greater than 5 acres in size. Phase III, effective July 1, 1977, extended jurisdiction to all waters of the United States,

regardless of size or navigability. The terms Phase I, II and III are still used to refer to different types of wetlands subject to the Corps' regulatory jurisdiction. Legislative attemtps to restrict jurisdiction failed in 1976 and 1977, except that the Clean Water Act of 1977 exempted certain activities from regulation and authorized the states to assume delegation of Section 404 permitting.[49]

Section 404 was accordingly extended to encompass:

> coastal waters, wetlands, mudflats, swamps and similar areas; freshwater lakes, rivers and streams that are used, were used in the past and are susceptible to use to transport intertate commerce, including all tributaries to those waters; interstate waters; certain specified intrastate waters, the pollution of which would affect interstate commerce; and freshwater wetlands, including marshes, shallows, swamps, and similar areas that are contiguous or adjacent to the above described lakes, rivers and streams, and that are periodically inundated and normally characterized by the prevalence of vegetation that requires saturated soil conditions for growth and reproduction.[50]

Recent judicial decisions have supported a broad jurisdictional application of the Section 404 permitting program as necessary to attain the objective of the Clean Water Act. For example, in Avoyelles Sportsmen's League v. Alexander,[51] the court was faced with the issue of determining whether certain bottomland hardwood swamps were wetlands subject to the jurisdiction of the Corps. The Corps defined wetlands as "those areas that are inundated or saturated by surface water or ground water at a frequency or duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions."[52] In

applying this definition, the Court considered three factors: the hydrologic regime, soils and the vegetation. Much of the land was subject to seasonal flooding and soil saturation. Soil types were indicative of such conditions. In addition, there was a prevalence of flood tolerant species. Accordingly, the court found the Corps' jurisdiction extended to the line at which species intolerant of flooding or saturated soils began to grow.

2. Activities Subject to Jurisdiction

The Clean Water Act authorizes the Corps to issue permits for "the discharge of dredged or fill material [from a point source] into the navigable waters at specified disposal sites."[53]

The statutory definition has been interpreted through judicial decision. A "point source" has been construed to include such machinery as dump trucks, draglines and bulldozers.[54] The clearing of bottomland hardwood trees and removal of their roots by plowing was held to be "a discharge of dredged or fill material" within the scope of regulation in Avoyelles Sportsmen's League v. Alexander.[55] The Court reasoned that wetland vegetation, to the extent it was sheared and piled on the ground, could constitute fill material. Further, clearing of the land involved scraping the soil, resulting in "a leveling effect which also qualified the material moved as fill material." In Weiszman v. Corps of Engineers,[56] the Court held that dredged material dripping from a dragline bucket constituted a discharge subject to permitting. As a matter of policy, however, the Corps

does not assert jurisdiction to the limits authorized by these decisions. The Corps position is that

> the term "fill material" means any material used for the primary purpose of replacing an aquatic area with dry land or of changing the bottom elevation of a water body.[57]

The Clean Water Act of 1977 exempted certain activities from the Section 404 permitting process. Specifically, it exempted the discharge of dredged or fill material:

> (A) from normal farming, silviculture, and ranching activities such as plowing, seeding, cultivating, minor drainage, harvesting for the production of food, fiber, and forest products, or upland soil and water conservation practices;
> (B) for the purpose of maintenance, including emergency reconstructon of recently damaged parts, of currently serviceable structures such as dikes, dams, levees, groins, riprap, breakwaters, causeways, and bridge abutments or approaches, and transportation structures;
> (C) for the purpose of construction or maintenance of farm or stock ponds or irrigation ditches, or the maintenance of drainage ditches;
> (D) for the purpose of construction of temporary sedimentation basins on a construction site which does not include placement of fill material into the navigable waters;
> (E) for the purpose of construction or maintenance of farm roads or forest roads, or temporary roads for moving mining equipment, where such roads are constructed and maintained, in accordance with best management practices, to assure that flow and circulation patterns and chemical and biological characteristics of the navigable waters are not impaired, that the reach of the navigable waters is not reduced, and that any adverse effect on the aquatic environment will be otherwise minimized;
> (F) resulting from any activity with respect to which a State has an approved program under section 208(b)(4).[58]

These exemptions do not apply, however, where the discharge is

> incidental to any activity having as its purpose bringing an area of the navigable waters into a use to which it was not previously subject, where the flow or circulation of navigable waters may be impaired or the reach of such waters be reduced.[59]

Certain federal construction projects are also exempted. This exemption is limited to federal construction projects specifically authorized by Congress and entirely planned, financed and constructed by a federal agency.[60] However, before such an exemption may apply, the federal agency involved must prepare an adequate Environmental Impact Statement (EIS) and make it available for congressional review prior to authorization or appropriation of funds. That EIS must consider the impact of the project in the light of the 404(b) guildelines (discussed infra) which embody the principal 404 permit standards. This exemption for federal projects was not extended to projects constructed under general or continuing authorities, maintenance projects or federally assisted projects. In practice, though, the Corps reportedly gives such projects less stringent review.

3. General Permits

The Corps is authorized to issue general permits on a state, regional or nationwide basis for categories of activities that are "similar in nature, will cause only minimal adverse environmental effects when performed separately, and will have only minimal cumulative adverse effects on the environment."[61] General permits are intended to allow specified activities to occur with minimal regulatory review, so long as the work is per-

formed in compliance with specified conditions. General permits are to be issued only after consideration of the Section 404(b) guidelines and are limited to a 5 year duration. They are revocable and modifiable at the discretion of the District Engineer if he determines that the activities do, in fact, have significant environmental effects or would be more suited for the individual permitting process.

Nationwide general permits have been issued covering three basic types of discharges: (1) Discharges that occurred before certain dates;[62] (2) Discharges to certain types of waters;[63] (3) Discharges associated with certain types of activities.[64] The first category seems intended to "grandfather" most discharges that occurred prior to implementation of Section 404. The third category permits discharges associated with a number of common activities such as back-filling of utility crossings, the construction of seawalls and other forms of bank stabilization; relatively minor road crossings; bridge construction, and maintenance of existing fill. Although many of these activities would seem likely to have significant cumulative adverse impacts in South Florida, the second category of general permits is of most concern. General permits have been granted for discharges to the following waters of the United States:

1. Rivers, streams and impoundments located above the headwaters, defined as the point at which average annual flow is less than 5 cubic feet per second;[65]

2. Natural lakes less than 10 acres in surface area (including adjacent wetlands);

3. Other non-tidal waters that are not tributary to interstate or navigable waters.

In addition, 28 general permits have been issued by the Jacksonville District. These generally cover piers, riprap, maintenance dredging, boat slips, back fill for bulkheads and similar types of construction, usually in specified counties.

4. Permit Review

The applicant for an individual permit must submit a complete description of the proposed activity before further review begins. An application will be considered incomplete unless it includes the plans, location, purpose, intended use, scheduling, names of adjoining property owners, location of adjacent structures and other permits required from federal, state or local agencies.[66] Certification by the state of compliance with water quality standards and of consistency with applicable coastal zone programs is required.[67] The applicant must also describe the type, composition and quantity of material to be discharged[68] and provide any additional information requested by the Corps.[69] Additional requirements may also exist for particular types of activities.

Once a completed application has been received, the review process begins. Some types of activities may require both Section 404 and Section 10 permits. When this is the case, the review is combined.

The application is initially evaluated to determine the probable impact on the public interest.[70] Issuance must be "found to be in the public interest."[71] The public interest review is a

balancing of the benefits and detriments of the proposal.

Factors considered include:

> conservation, economics, aesthetics, general environmental concerns, historic values, fish and wildlife values, flood damage prevention, land use, navigation, recreation, water supply, water quality, energy needs, safety, food production, and, in general, the needs and welfare of the people.[72]

The following general criteria are considered:

> (i) The relative extent of the public and private need for the proposed structure or work;
> (ii) The desirability of using appropriate alternative locations and methods to accomplish the objective of the proposed structure or work;
> (iii) The extent and permanence of the beneficial and/or detrimental effects which the proposed structure or work may have on the public and private uses to which the area is suited; and
> (iv) The probable impact of each proposal in relation to the cumulative effect created by other existing and anticipated structures or work in the general area.[73]

The regulations specifically discourage the unnecessary alteration or destruction of wetlands[74] and specify special considerations governing activities in wetlands that "perform functions important to the public interest."[75] Such wetlands include:

> (i) Wetlands which serve important natural biological functions, including food chain production, general habitat, and nesting, spawning, rearing and nesting sites for aquatic or land species;
> (ii) Wetlands set aside for study of the aquatic environment or as sanctuaries or refuges;
> (iii) Wetlands, the destruction or alteration of which would affect detrimentally natural drainage characteristics, sedimentation patterns, salinity distribution, flushing characteristics, current patterns or other

environmental characteristics;
(iv) Wetlands which are significant in shielding other areas from wave action, erosion or storm damage. Such wetlands are often associated with barrier beaches, islands, reefs and bars;
(v) Wetlands which are prime natural recharge areas. Prime recharge areas are locations where surface and ground water are directly interconnected; and
(vi) Wetlands through natural water filtration processes serve to purify water.[76]

No permit is to be granted unless "the benefits of the proposed alteration outweigh the damage to the wetlands resource and the proposed alteration is necessary to realize those benefits."[77] In determining the necessity of the alteration, the District Engineer is to consider "whether the proposed activity is primarily dependent on being located in, or located in close proximity to the aquatic environment and whether feasible alternative sites are available."[78]

The regulations also provide for consideration of cumulative impacts:

(3)Although a particular alteration of wetlands may constitute a minor change, the cumulative effect of numerous such piecemeal changes often results in a major impairment of the wetland resources. Thus, the particular wetland site for which an application is made will be evaluated with the recognition that it is part of a complete and interrelated wetland area. In addition, the District Engineer may undertake reviews of particular wetland areas in consultation with the appropriate Regional Director of the Fish and Wildlife Service, the Regional Director of the National Marine Fisheries Service of the National Oceanic and Atmospheric Administration, the Regional Administrator of the Environmental Protection Agency, the local representative of the Soil Conservation Service of the Department of Agriculture, and the head of the appropriate State agency to assess the cumulative effect of activities in such areas.[79]

After the Public Interest Review has been completed the Corps must give careful consideration to the EPA guidelines[80] as required by Section 404(b) of the Act. The 404(b) guidelines are generally consistent with the requirements of the Corps' regulations relating to wetlands. However, in some cases, they are more stringent and have adopted as a guide the principle that "degradation or destruction of special sites such as wetlands may represent an irreversible loss of valuable aquatic resources."[81] The guidelines are generally binding unless denial of a permit would have a detrimental economic effect on navigation and anchorage.[82] However, Section 404(b) provides for an absolute veto by the EPA should it find that the discharge will:

> have an unacceptable adverse effect on municipal water supplies, shellfish beds and fishery areas including spawning and breeding areas, wildlife or recreational areas.[83]

Section 404(c) thus seemingly allows the EPA to make the ultimate decision as to the issuance of a permit, at least as regards those specifically defined areas. The U.S. Fish and Wildlife Service of the Department of Interior and the National Marine Fisheries Service of the Department of Commerce also play significant roles in reviewing activities subject to 404 permit requirements. Their role exists because federally issued 404 permits are subject to the requirement of the Fish and Wildlife Coordination Act.[84] The Corps is required to "give great weight to these views on fish and wildlife considerations in evaluating the application."[85] The permit may be conditioned to mitigate fish and wildlife impacts.

The permit that is eventually issued may allow an activity that is significantly different from the one originally proposed. In order to protect the public interest and reduce adverse environmental consequences the Corps may "urge the applicant to modify his proposal to eliminate or mitigate any damage. . . . and in appropriate cases the permit may be conditioned to accomplish this purpose."[86] There are, however, both legislative and administrative limitations placed upon the inclusion of conditions in the 404 permits.[87]

5. Enforcement

Discharge of dredged or fill material without a permit or in violation of the terms and conditions of a permit is a violation of the Clean Water Act[88] and may subject the violator to civil[89] and criminal penalties.[90] Until recently, the Corps relied on the authority of EPA to enforce violation involving the failure to obtain a permit.[91] The Corps is now apparently authorized to prosecute violations under its own authority.[92] The Corps typically issues a cease and desist order upon discovering a violation and if that does not result in compliance seeks injunctive relief in federal court. Restoration is an appropriate, and perhaps the most effective, remedy.[93]

B. The Florida Department of Environmental Regulation

The Florida Department of Environmental Regulation (DER) regulates dredge and fill activities in waters of the State pursuant to Chapters 253 and 403, Florida Statutes. Chapter 253 gives DER jurisdiction over a more limited area--the beds of navigable waters--but allows the Department to make decisions based on a broader range of environmental criteria. Chapter 403 extends the jurisdiction of DER to more wetland areas, but limits consideration to water quality impacts. Regulation under Chapter 403 will be emphasized in this discussion because it more nearly corresponds to the jurisdiction of the Corps under Section 404 of the Clean Water Act.

1. Lands Subject To Jurisdiction

Chapter 253 grants regulatory jurisdiction to DER over certain activities in the navigable waters of the state.[94] Chapter 253 jurisdiction extends to the line of mean high water in coastal areas and the ordinary high water mark of inland, navigable waters.[95]

Jurisdiction under Chapter 403[96] extends to a broader category of submerged lands, defined by reference to a specific list of waters of the state[97] and a list of wetland vegetative indicators.[98] The waters of the state subject to permitting jurisdiction include all of the navigable and tidal waters subject to Ch. 253 and their "natural tributaries." Waters of the state also include artificially created waterbodies connected to them. Natural tributaries, however, do not include:

> intermittent natural water courses which act as tributaries only following the occurrence of rainfall and which normally do not contain contiguous areas of standing water.[99]

In addition, although natural lakes are considered waters of the state, the term does not include lakes that:

a. Are owned entirely by one person;[100] or

b. become dry each year and are without standing water;[101] or

c. are no more than 10 acres of water area at a maximum average depth of 2 feet existing throughout the year.[102]

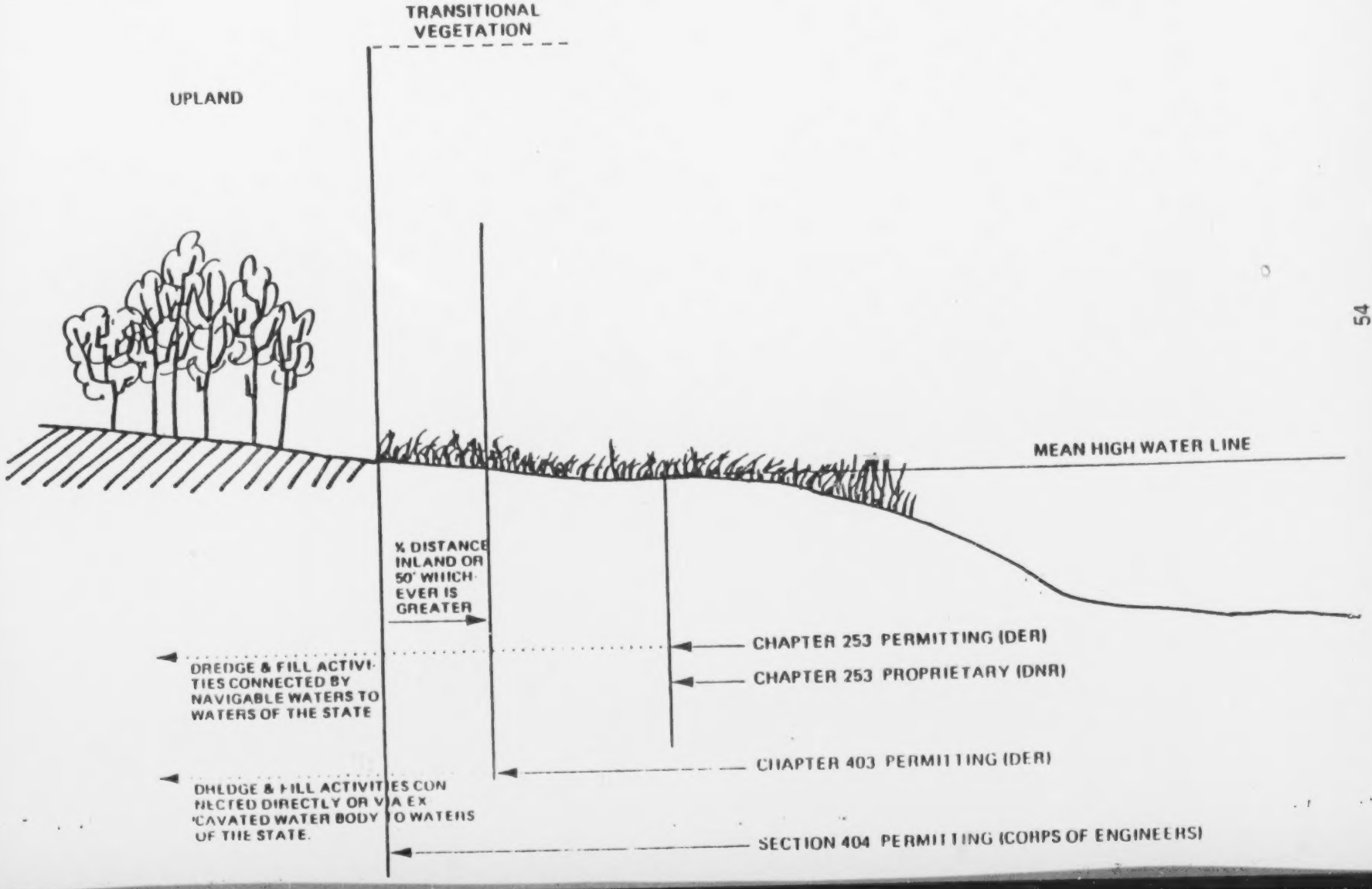
The landward extent of submerged lands is defined by reference to a list of vegetative species.[103] Lands contiguous to waters of the state on which a combination of the listed species constitutes the dominant plant community are considered submerged lands subject to Ch. 403 jurisdiction. In addition, this jurisdiction may include a "transitional zone" consisting of the first 50 feet landward of submerged lands or 1/4 of the distance between submerged and upland lands, whichever is greater.[104] Jurisdiction does not extend to this transition zone, however, unless specified transitional species constitute the dominant plant community.[105] Figure 15 attempts to illustrate the respective jurisdictional areas.

2. Activities subject to regulation

The Department of Environmental Regulation requires permits for the construction or installation of various structures, dredging or filling in waters subject to regulation.[106] A long list of activities are exempt from permitting, although they are required to meet state water quality standards.[107] In abbreviated form, these include:[108]

FIGURE 15

REPRESENTATIVE STATE DREDGE AND FILL JURISDICTION[109]


TRANSITIONAL VEGETATION
UPLAND
MEAN HIGH WATER LINE
% DISTANCE INLAND OR 50' WHICH EVER IS GREATER
CHAPTER 253 PERMITTING (DER)
CHAPTER 253 PROPRIETARY (DNR)
DREDGE & FILL ACTIVITIES CONNECTED BY NAVIGABLE WATERS TO WATERS OF THE STATE
CHAPTER 403 PERMITTING (DER)
DREDGE & FILL ACTIVITIES CONNECTED DIRECTLY OR VIA EXCAVATED WATER BODY TO WATERS OF THE STATE.
SECTION 404 PERMITTING (CORPS OF ENGINEERS)

1. installation of overhead transmission lines;

2. installation of aids to navigation;

3. installation and repair of mooring pilings and dolphins;

4. installation and repair of private docks less than 1,000 square feet;

5. maintenance of existing channels, canals and intake and discharge structures;

6. installation of boat ramps on artificial bodies of water;

7. the construction of seawalls and private docks in artificially created waterways;

8. the replacement or repair of existing docks to the same configuration;

9. restoration of seawalls;

10. maintenance of existing dikes and irrigation and drainage ditches;

11. repair or replacement of stormwater discharge pipes;

12. construction and maintenance of swales;

13. dredging or filling approved pursuant to the Florida Electrical Power Plant Siting Act;

14. the deposition of up to 25 cubic yards of material every six months in the transitional zone of a submerged land, subject to suspension for cause;

15. artificial waterways behind control structures permitted by a water management district, except those to be used for residential purposes or directly connected to works of the district or constructed in waters of the state;

16. artificial waterways that are normally dry;

17. artificial waterways for commercial forestry operations and

18. the installation of subaqueous transmission and distribution lines.

3. Processing of Permit Applications

The processing of permit applications by DER is coordinated

with review by the Corps of Engineers pursuant to a Memorandum of Understanding executed in 1976. This memorandum provides for the use of a joint application form. Two copies of an application must be submitted to either DER or the Corps, which will forward one copy to the other agency. Although their decisions are made independently, the two agencies may use joint public notices and cooperate with each other in their review of the project.

So-called short form applications, which may be submitted for projects below specified thresholds, are processed by a District Office.[110] Standard form applications are processed by the Tallahassee office of DER, using field inspection reports provided by the District Office. Ironically, the application forms are exactly the same. Figure 16 shows the jurisdiction of the various District offices. The South Florida study area includes parts of four District offices.

The application is first evaluated for completeness. DER must request any additional information required to evaluate the project within 30 days of receipt of the application or lose the right to deny the permit for lack of sufficient information to evaluate the impacts.[111] During the completeness evaluation, DER also determines whether a hydrographic survey is needed, in the case of a Ch. 253 permit.[112] Once a completed application has been received, the agency has 90 days to evaluate it.[113] If no formal action is taken, the permit is deemed issued by default. Standard conditions, however, may be incorporated into the permit.

4. Criteria for Review of Permits

The criteria for reviewing a permit application depend on

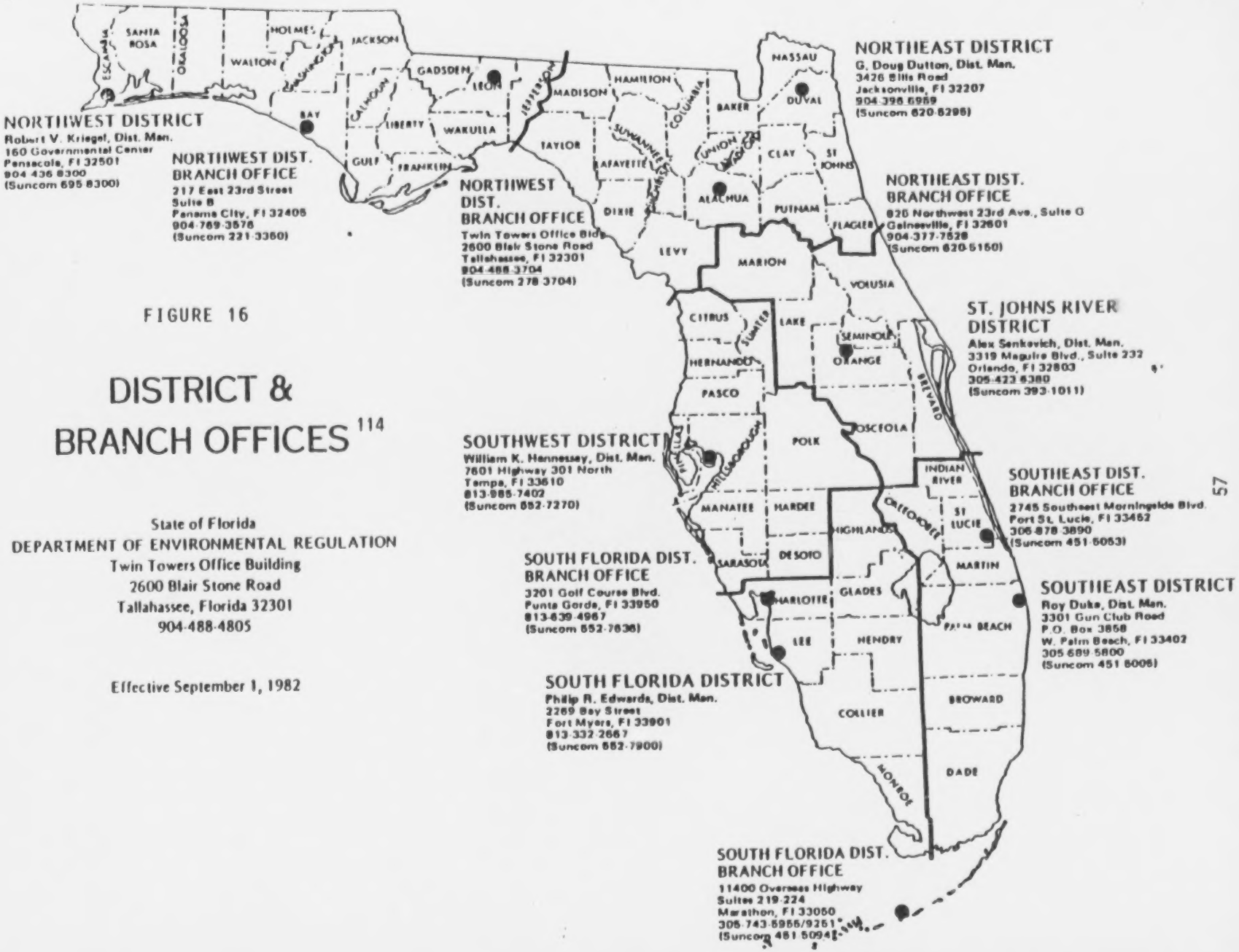


FIGURE 16

DISTRICT & BRANCH OFFICES[114]

State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32301
904-488-4805

Effective September 1, 1982

whether the activity falls within Ch. 253 or Ch. 403 jurisdiction. Dredge and fill activities below ordinary high water or mean high water on navigable waters, and thus subject to Ch. 253, may be evaluated for compliance with a broad range of criteria. An ecological study and a biological survey must be conducted. An hydrographic survey may also be required. Such studies must show, with regard to dredging, that it

> will not interfere with the conservation of fish, marine and wildlife or other natural resources, to such an extent as to be contrary to the public interest, and will not result in the destruction of oyster beds, clam beds, or marine productivity, including, but not limited to, destruction of natural marine habitats, grass flats suitable as nursery or feeding grounds for marine life, and established marine soilds suitable for producing plant growth of a type useful as nursery or feeding grounds for marine life or natural shoreline processes to such an extent as to be contrary to the public interests.[115]

If application is made to fill land pursuant to Chapter 253, consideration must be given to

> whether the granting of such permit and the construction to be done pursuant thereto would interfere with the conservation of fish, marine and wildlife or other natural resources to such an extent as to be contrary to the public interest, and whether the destuction of oyster beds, clam beds, or marine productivity, including, but not limited to destruction of natural marine habitats, grass flats suitable as nursery or feeding grounds for marine life, including established marine soil suitable for producing plant growth of a type useful as nursery or feeding grounds for marine life, will result therefrom to such an extent as to be contrary to the public interest.[116]

In addition, there must be a finding made

> that no harmful obstruction to or alteration

> of the natural flow of the navigable water . . . within such area will arise from the proposed construction, that no harmful or increased erosion, shoaling of channels or stagnant areas of water will be created thereby, and that no material injury or monetary damage to adjoining land will accrue therefrom. . . .[117]

The review of applications for Ch. 403 permits, which regulate dredge and fill activities in much more extensive areas of wetlands than does Ch. 253, is limited to consideration of water quality impacts. To receive a Ch. 403 permit, the applicant has to provide "reasonable assurance" the project will meet state water quality standards.[118] Biological impacts and other factors of concern may be considered only to the extent they are related to water quality.[119] For example, the destruction of wetland vegetation may be considered, but only to the extent that loss of wetland vegetation would affect water quality through loss of its biological filtering capabilities or its function of binding soil and thus reducing sedimentation. The effect of degraded water quality on biological processes may also be considered.[120]

5. Dredge and Fill Permit Statistics

Available statistical information regarding the DER dredge and fill permitting program is reproduced in Tables 2 and 3 for the sixteen counties in the study area.[121] Data covering 2.5 years of short form permitting and 5.5 years of standard form permitting was available. The largest number of permits issued are short form (1,637), but a large number of standard form projects (457) were also issued. Relatively few permits were denied: 32 standard form and 98 short form. Field inspection

TABLE 2

DER SHORT FORM DREDGE AND FILL PERMIT STATISTICS[122]
FOR JULY 1978 THRU FEBRUARY 1981 - BY COUNTY

County	Total Short Form Applications	Number of Permits Issued	Number of Permits Denied	Total Average Time to Issue a Permit (Days)*	Total Average Time to Deny a Permit (Days)*
Broward	175	172	3	122	333
Charlotte**	108	101	7	80	148
Collier	171	162	9	98	249
Dade	151	146	5	126	277
Glades	7	7	0	58	-
Hendry	16	16	0	103	-
Highlands**	17	17	0	91	-
Lee	228	207	21	109	166
Martin	123	116	7	132	466
Monroe	214	181	33	118	232
Okeechobee	23	23	0	90	-
Orange**	84	81	3	96	232
Osceola**	36	35	1	134	167
Palm Beach	218	212	6	150	123
Polk**	96	93	3	130	185
St. Lucie	68	68	0	152	-
Totals	1735	1637	98		

Source: DER Permit Application Tracking Systems (PATS) Statistical Reports

*Includes time in days it takes to receive a complete application.
DNR, GFWFC, etc. review time comprises the majority of this processing time.

**County is only partially in the study area.

TABLE 3

DER STANDARD FORM DREDGE AND FILL PERMIT STATISTICS BY COUNTY[123]
1975-1980

County	Total Permits Issued #	Public #	Private #	Total Dredge & Fill (Cubic Yards)	Public Dredge & Fill (Cubic Yards)	Private Dredge & Fill (Cubic Yards)	Total Length Protective Structures (feet)	Public Protective Structures	Private Protective Structures	WETLOSS** #	Permits Denied (WETLOSS) #
Broward	67	33	34	37,150,325	18,823,922	18,823,922	13,450	300	13,150	24	5(5)
Charlotte*	39	18	21	13,216,497	341,107	12,975,390	27,155	5,500	21,605	6	2(2)
Collier	26	18	21	1,990,664	1,095,452	895,212	15,280	147	15,133	10	1(1)
Dade	77	39	38	72,314,013	52,108,741	20,205,272	31,008	6,259	24,749	16	3(3)
Glades	5	5	0	234,385	234,385	0	0	0	0	0	0(0)
Hendry	1	1	0	5,400	5,400	0	0	0	0	0	0(0)
Highlands*	0	0	0	0	0	0	0	0	0	0	0(0)
Lee	39	18	21	3,731,653	1,781,481	1,950,177	11,720	200	11,520	18	1(1)
Martin	30	8	22	11,666,269	10,748,300	917,969	5,101	3,720	1,381	6	3(1)
Monroe	73	45	28	2,076,839	1,216,124	860,715	21,010	6,415	14,595	45	7(7)
Okeechobee	4	2	2	142,520	34,860	107,660	0	0	0	3	0(0)
Orange*	11	4	7	1,257,374	1,108,367	149,007	550	0	550	7	2(2)
Osceola*	1	0	1	0	0	0	0	0	0	1	0(0)
Palm Beach	56	23	33	6,834,064	3,861,899	2,972,165	32,408	2,850	29,558	18	3(3)
Polk	12	5	7	128,107,138	133,539	127,973,599	0	0	0	5	4(3)
St. Lucie	16	10	6	2,356,780	1,086,230	1,290,550	1,770	1,600	170	6	1(1)
Total	457	226	231	281,083,921	92,062,388	189,021,638	159,452	27,041	132,411	165	32(29)

Source: Developed from data and information within DER Standard Form Monthly Reports, July 1975 through December 1980.

*County is only partially in the study area

**WETLOSS indicates permits where field inspection reported significant loss of wetlands with resulting degradation of water quality and fish and wildlife

reports indicated there would be significant wetland loss with resulting degradation of water quality and fish and wildlife values in 165 of the standard form permit applications. Wetland loss was a factor in 29 of the permits denied. It is unknown how many projects were modified to reduce wetland impacts. Although there is no data available indicating the number of acres lost by issuance of dredge and fill permits, standard form permits allowed the movement of 281,083,921 cubic yards of material and the construction of 159,452 feet of protective shoreline structures. The high volume of material moved in Dade and Broward Counties may be at least partially attributable to the renourishment of Miami Beach (10-15 million cubic yards) and the excavation of rock pits. 20-50 million cubic yards may be dredged from one large rock pit. Similarly, in Polk County, there are enormous phosphate mines, all of which are outside of the study area.

C. South Florida Water Management District

The South Florida Water Management District operates the levees, canals, pump stations and other works of the Central and Southern Florida Flood Control Project in cooperation with the Corps of Engineers. In addition, the District exercises regulatory authority over consumptive use of water, well construction and similar water management activities that affect wetlands.[124] The permitting program most directly related to wetlands, though, regulates the construction and operation of surface water management systems.

The Florida Water Resources Act[125] gives the District authority to

> require such permits and impose such reasonable conditions as are necessary to assure that the construction or alteration of any dam, impoundment, reservoir, appurtenant work, or works will not be harmful to the water resources of the district.[126]

and,

> require such permits and impose such reasonable conditions as are necessary to assure that the operation or maintenance of any dam, impoundment, reservoir, appurtenant work, or works will not be inconsistent with the overall objectives of the district and will not be harmful to the water resources of the district.[127]

The potential breadth of this authority is revealed by an examination of the statutory definitions for the terms use. In particular, a "dam" is defined as ". . . any artificial or natural barrier, with appurtenant works, raised to obstruct or impound, or which does obstruct or impound, any of the surface waters of the state.[128] "Surface water" in turn is ". . . water upon the surface of the earth, whether contained in bounds created naturally or artificially or diffused."[129] "Works" are defined as ". . . all artificial structures not included in subsection (1) and (2), including but not limited to, ditches, canals, conduits, channels, culverts, pipes, and other construction that connects to, draws water from, drains water into, or is placed in or across, the waters in the state. . . ."[130]

Virtually any filling or grading could create a "dam" as defined in this statute. It is difficult to conceive of a construction project which would not result in the creation of

"works" in the form of swales, gutters, ditches and culverts. It appears, then, that the District is authorized to control many of the land surface alterations and drainage systems that degrade wetlands in South Florida.

Several exemptions must also be considered. The statute provides:

> (1) Nothing herein, or in any rule, regulation, or order adopted pursuant hereto, shall be construed to affect the right of any natural person to capture, discharge, and use water for purposes permitted by law.
> (2) Nothing herein, or in any rule, regulation, or order adopted pursuant hereto, shall be construed to affect the right of any person engaged in the occupation of agriculture, silviculture, floriculture, or horticulature to alter the topography of any tract of land for purposes consistent with the practice of such occupation. However, such alteration may not be for the sole or predominant purpose of impounding or obstructing surface waters.
> (3) Nothing herein, or in any rule, regulation, or order adopted pursuant hereto, shall be construed to be applicable to construction, operation, or maintenance of any agricultural closed system.[131]

The South Florida Water Management District currently requires permits for the construction of most impervious surfaces and drainage systems. Most minor projects can be constructed pursuant to general permits, provided certain notification requirements and conditions are met.[132] One condition is that "the project must not be located in natural water bodies or viable wetlands habitat."[133] Projects that do not qualify for a general permit and are not exempt, must apply for an individual permit.[134] Conditions for the issuance of permits include such general criteria as:

> (a) provides adequate flood protection and

drainage,
(b) will not cause adverse water quality and quantity impacts. . . .
(c) will not cause adverse impacts on surface and groundwater levels and flows,
(d) will not cause adverse environmental impacts.[135]

More detailed criteria apply to projects with two or more acres of impervious area.[136] These include consideration of impact to wetlands. For example, in assessing environmental impacts the staff is directed to distinguish between:

> a. Environmental features directly related to the water resources of the District, such as
>
> (i) Viable wetlands habitat except those previously impacted by drainage, land clearing, earthwork, or those which have been invaded by exotic species and therefore are in a state of normal environmental decay.
>
> (ii) Natural waterbodies, [and]
>
> b. Environmental features which may be indirectly related to the water resources of the District, such as:
>
> (i) Intermittent ponds.
>
> (ii) Significant habitat diversity support systems, usually consisting of highly productive mixed upland and wetlands systems with appropriate buffer areas.[137]

No recommendation may be made by the staff regarding environmental impacts that are not directly related to the water resources of the District.[138] Overall, the criteria seem primarily designed to ensure that adequate flood protection is achieved without overdrainage or excesssive water quality degradation. To the extent wetlands function to serve these purposes and cannot be reengineered, they are given protection.

D. General Comparison of Regulatory Programs

This section will make some general comparison of the regulatory programs described above, concentrating on the differences between the DER and Corps of Engineers permitting activities. Local governments generally play a relatively minor role in wetlands regulation. This may be due to the inordinante political influence local development interests can bring to bear.

1. Lands Subject to Regulation

A quantitative comparison of lands regulated by DER and the Corps is not possible. In general, however, the Corps exercises much broader jurisdiction. The definition of navigable waters used to establish DER Ch. 253 jurisdiction is even more limited than the definition used to establish the Corps' Section 10 jurisdiction. It excludes waters that are capable of being used for commercial navigation by reasonable artificial improvements.[139] The Corps' definition includes such waters.[140]

The Corps' jurisdiction under Section 404 is also considerably broader than DER's jurisdiction under Chapter 403 and Rule 17-4, F.A.C. Corps jurisdiction extends to all "waters of the United States" to the extent necessary to exercise commerce clause authority in pursuit of the goals of the Clean Water Act. The definition of "wetlands" used by the Corps reflects this broad grant. DER, on the other hand, is severely constrained by the definition of "waters of the state" and the exclusions it contains. The procedure for identifying contiguous wetlands is also more limited. Whereas the Corps can consider a combination

of soils, vegetation and hydrologic factors, DER can only regulate areas where there is a dominance of species that are included in an out-of-date list. The wetlands vegetation list was adopted many years ago and has never been changed because legislative approval would be necessary and uncertain. The list does not include several species indicative of wetlands in South Florida. In addition, any break in the continuity of contiguous dominant species limits the extent of jurisdiction. A natural berm, for example, or fill such as a dike or road, between waters of the state and an area of wetlands breaks the continuity and precludes the successful assertion of jurisdiction by DER. If DER can show the fill was illegal, it will claim jurisdiction, but that is often difficult to do. The Corps is not similarly limited.

2. Activities Subject to Regulation

DER regulates the construction or installation of structures, dredging or filling in the areas subject to its jurisdiction. The Corps of Engineers regulates such a full range of activities only under Section 10. Sction 404 is limited to the discharge of dredged or fill material. Although there is substantial judicial precedent for a broad interpretation of what activities constitute a discharge of dredged or fill material, the Corps takes a conservative stance. It refuses, for example, to assert jurisdiction over the excavation of wetlands when the dragline operates from uplands and deposits spoil on uplands. In this regard, then, DER has broader jurisdiction than the Corps.

Neither DER or the Corps appears to exert jurisdiction over

drainage activities, which are probably the greatest threat to freshwater wetlands in South Florida. The South Florida Water Management District apears to exercise the greatest influence over this activity both through surface water management system permitting and its control of the primary drainage system.

A number of activities have been exempted from DER and Corps jurisdiction. In addition, the Corps general permit program removes many activities from the purview of effective control.

3. Criteria for Evaluation of Permits

The Corps is generally authorized to consider a much broader range of factors in evaluating permit applications than is DER. Although DER can consider fish and wildlife, hydrographic and similar wetland values in addition to water quality in evaluating Ch. 253 permits, only a relatively small proportion of the wetlands in South Florida are subject to jurisdiction under that statute. Chapter 403, which authorizes regulation of a much larger area, only provides for consideration of water quality impacts. The Corps, on the other hand, can consider the impact of a discharge on a broad range of wetland functions and is specifically directed to consider fish and wildlife impacts. In addition, the Corps is allowed to consider cumulative impacts of development on those values. One factor of some importance in both programs, though unauthorized, is politics. Many people believe the decisions made by DER have been more politically influenced than decisions made by the Corps, although that may be changing. Public works projects are most likely to be influenced by political considerations. Most decisions, however, are not at all politically influenced.

4. Permitting Process

Both DER and the Corps use a similar procedure for evaluating permit applications. Field inspectors meet with the applicant, visit the site, establish jurisdictional boundaries and informally negotiate with the applicant regarding design of the project. All permit decisions for the Corps are made by the District Engineer in Jacksonville on the basis of field inspection reports from local offices in the South Florida area. Recommendations regarding approval of the project are submitted separately from the field inspection report. DER follows a similar procedure, except that short form permits are issued by the District Offices. Decisions regarding standard form permits are made in Tallahassee.

DER is also subject to several constraints imposed by the Florida Legislature. An elaborate system of time clocks, deadlines, requirements for citation of rules, etc. regulates the processing of permit applications. The penalty if DER makes a mistake is issuance of a default permit, loss of the right to base a permitting decision on certain factors or some other forfeiture of DER's role as protector of the public interests involved.

5. Judicial Support

Decisions by the federal courts regarding the Corps' permitting program indicate strong judicial support for wetlands regulation. Federal tests for taking, for example, seem more liberal than their counterparts in the Florida courts.[141] The doctrine of equitable estoppel is a particular burden on the DER

permitting program. The courts of Florida have held that DER is equitably estopped to deny permits to fill submerged lands that were originally sold by the state with the expectation by all parties that they would be developed.[142] Given the history of state land acquisition and disposal practices, this is an enormous burden. The water management district, acting under authority of the state, faces a similar problem. In addition, the water management district faces unique difficulties preventing wetlands conversion in its own conservation areas. The South Florida Water Management District only purchased flowage easements for much of the land and owners of the fee claim rights to develop the land in ways consistent with the easement that cannot be denied by the District.[143] Both DER and the water management district frequently rely on the Corps to stop damaging projects where, for the reasons described above, they are blocked from taking action.

6. Budget and Personnel

The Corps seems better able than DER to attract and hold qualified personnel to work in the permitting program. DER simply pays inadequate salaries for demanding, highly skilled work.[144] Table 4 shows a comparison of salaries between DER and several other agencies, including the Corps, in South Florida. There are reportedly even greater discrepencies between the public and private sector. People with experience in the wetlands permitting programs of the public agencies find ready private employment at much higher rates of pay than working for the government. Among the people with ability, only the most

TABLE 4

COMPARABLE PAY SCALES FOR PUBLIC AGENCIES INVOLVED IN ENVIRONMENTAL PERMITTING IN SOUTH FLORIDA

POSITION	MINIMUM EXPERIENCE	PAY SCALE/PER YEAR	PAY DIFFERENCE BETWEEN COMPARABLE DER POSITION/YR.
Environmental Specialist II (Dept. of Environmental Regulation)	BS + 2 yrs. or MS + 1 yr.	$12,430-$16,996	-0-
Environmentalist II (South Florida Water Mgmt. Dist.)	BS + 2 yrs. or MS + 0 yrs.	$18,324-$24,544	+ $5,504-$7,548
Biologist II (Dade County Environmental Resources Management)	BS + 1 yr. or MS + 0 yrs.	$18,570-$23,533	+ $5,750-$6,537
Biologist - G.S. 9 (U.S. Army Corps Engineers)	BS + 2 yrs. or MS + 0 yrs.	$18,585-$24,163	+ $5,765-$7,169
Environmental Specialist III (Dept. of Environmental Regulation)	BS + 3 yrs. or MS + 2 yrs.	$16,265-$21,882	-0-
Environmentalist III (South Florida Water Mgmt. Dist.)	BS + 4 yrs. or MS + 2 yrs.	$21,569-$28,891	+ $5,304-$7,009
Biologist III (Dade County Environmental Resources Management)	BS + 2 yrs. or MS + 1 yr.	$25,781-$32,552	+ $9,516-$10,670
Biologist - G.S. 11 (U.S. Army Corps Engineers)	BS + 3 yrs. or MS + 1 yr.	$22,486-$29,236	+ $6,221-$7,354
D.E.R. non-professional positions with area differential (Palm Beach County)			
Engineer Technician III	HS + 3 yrs. or AA (2 yr. degree)	$12,674-$16,745	
Engineer Technician IV	HS + 5 yrs. or AA + 3 yrs.	$14,198-$18,875	

Source: DER West Palm Beach Subdistrict Office

dedicated remain with the agencies at a sacrifice to their financial position. Fortunately, DER has a core group of such people. Most of the personnel in the field do not stay with the agency very long. A study of the District Offices showed that over a five year period each position has had an average of 3.4 people.[146] One position had 8 people in five years. This lack of continuity is crippling in the view of most observors. Further, as one noted,

> It is a disgrace to see people with masters degrees and perhaps 4 or 5 years permitting experience dealing with million dollar projects--being paid a wage equivalent of less than a garbage man gets in Dade County.[147]

7. Enforcement

Both DER and the Corps have similar powers of enforcement. The Budget and personnel problems of DER discussed above make the Corps somewhat more effective in this area. DER currently has only one enforcement position in the Southeast District Office and that has been vacant for six months. The Corps has several people working in enforcement, but is probably unable to detect many violations. In the Keys, for example, at one time the field inspector was monitored on an hourly basis by marine contractors using CB radios, making it relatively easy to evade him.

When a violation is discovered, both agencies have difficulty taking effective action. Cease and desist orders are frequently ignored. Sometimes there is no response until an order has been issued by a District Judge. By that time much of the damage to wetlands will have been accomplished. The issue then becomes one of whether the government can force the violator to restore the

area. If restoration can be imposed then the violator stands to gain nothing. Penalties and attorneys fees are typically paid as a cost of doing business. The judicial test for determining when restoration should be ordered, however, is a tough one for the government to meet.[148]

One advantage the Corps has over DER in enforcement cases is the quality of legal representation and expert witnesses it can bring to bear. Corps enforcement actions are prosecuted by the Justice Department and U.S. Attorneys. The attorneys involved are frequently very experienced. DER legal staff tend to be less experienced. In addition, DER legal staff have to rely almost exclusively on DER scientists and engineers as expert witnesses because the agency does not have the funds to hire outside consultants. Fortunately, DER has a few well-qualified experts on its staff. They cannot be experts on everything, however, and are frequently limited in their ability to do the site-specific field work that is necessary to render solid professional opinions. By contrast, the U.S. Attorney, who has access to highly-regarded experts in the Fish and Wildlife service and in the Corps, can also hire outside consultants relatively easily. In a current case in the Keys (Niles Channel), for example, DER is essentially relying on the ability of the U.S. Attorney to hire three experts at $6,000.00 each to prove the case. Variables such as those described above may account for the tendency noted by many people for DER to issue an excessive number of "after the fact" permits rather than seek penalties and restoration for violations.[147]

VI. Case Studies: Effectiveness of the Regulatory Process

A. Introduction

The major purpose of this analysis is to assess the effectiveness of the current wetlands regulatory process, particularly the Section 404 program. Prior to the early 1970s, there were virtually no constraints on wetlands conversion in South Florida. Section 404 was not enacted until 1972 and subsequent implementation was delayed. Phase III wetlands were not protected until 1977. Previous sections of this report have described in general terms the damage caused by wetlands converson in South Florida prior to implementation of the current regulatory system. There is every reason to assume that landowners would have continued converting wetlands in the absence of Section 404 and state controls, although it is impossible to state with quantitative precision how many acres or what types of wetlands have not been converted because of Section 404. It is also not possible, because of time limitations, to state how many acres or what types of wetlands have been protected by denial or modification of permit applications. But after interviewing numerous persons involved in the permitting process and reviewing relevant permit files, it is apparent that, despite some serious deficiencies in the effectiveness of the process, it is helping to protect valuable wetlands functions in South Florida. Numerous specific projects have been prevented or their adverse impacts have been substantially reduced because of Section 404. At the same time, though, extensive conversion of wetlands is occurring despite the regulatory program of the Corps of Engineers.

The discussion that follows will look at specific areas within the South Florida region with a view toward assessing the effectivenesss of the Section 404 program.

B. Loxahatchee Slough

The Loxahatchee Slough is a wetland area of Western Palm Beach County in the basin of the Loxahatchee River. There are numerous shallow ponds in the area, separated by slightly higher ground on which pines and palmettos grow. During the dry season, the ponds are separated from each other and from the Loxahatchee River. Yet during the wet season, ground water levels rise, the ponds overflow and water moves slowly in sheet flow toward the ocean. Because the soils of the area are sandy, the Loxahatchee Slough is a prime recharge area for ground water. In addition, the ponds support healthy populations of bass, sunfish, amphibians, birds and other wildlife. A thin clay layer on the bottoms of the ponds allows them to retain water during dry periods when ground water levels recede. This relatively impermeable layer can be breached by dredging activities, though, causing the ponds to drain during the dry season and thereby destroying their ecological function.

The area has come under intensive development pressure in recent years as developers seek to avoid higher priced uplands near the coast. Developers will typically come into an area, dredge a deep (40 feet) borrow pit and use the fill to construct foundation pads for houses, road beds and dikes. Dikes are placed around the ponds and water is pumped into them for drainage, lowering the water table. Water quality in the ponds

is consequently degraded.

The Corps has been unable or unwilling to assert effective jurisdiction. The ten acre lake exemption excludes many of the ponds from regulation. Although the land is a patchwork of ponds, most of them are relatively small. The general permit for work conducted above "headwaters" also effectively exempts many projects. Although more than 5 CFS might flow through a water-course during wet periods, it would be dry during other times in the yearly cycle. In addition, much of the damage is caused by developers who excavate fill from wetlands but discharge it on uplands. The Corps holds that such activities are not subject to permitting. Drainage ditches are frequently excavated in this manner to drain wetlands. The installation of pumps is also exempt, except for small areas of fill that might be created to locate the pump or associated structures. Consequently, it appears that a considerable amount of valuable wetlands is being lost in the Loxahatchee Slough despite the Section 404 regulatory program.

C. Western Broward County

Substantial loss of wetlands is occurring in Western Broward County under circumstances where Section 404 jurisdiction is questionable. One area that illustrates the trend is the land south of S.R. 84 and East of U.S. 27. Developers have apparently learned to avoid wetlands regulation through the use of several techniques.

The area is sawgrass and marsh wetlands that was part of the original Everglades but was not included in the Conservation

Areas established as part of the Central And Southern Florida Flood Control Project. Pump stations have been installed to move water over the Conservation Area dikes to the West. This has lowered water levels and somewhat degraded the area by allowing invasion by exotic, nuisance plants (Malaleuca). Local rainfall and water leaking through the dikes, however, have maintained the area as an identifiable wetlands community.

Recently, however, landowners have begun to develop the area. Old agricultural ditches have been restored to enhance drainage. Such "maintenance" is generally exempt from permitting. In addition, developers are directly destroying the wetlands vegetation in an apparent effort to remove the area from permitting jurisdiction. Tractors with bushhogs or bulldozers pulling choppers are brought onto the land during the dry season. Sawgrass, which is a wetland indicator species, is mowed and chopped into the soil. Grass seed and fertilizer are spread by aerial application. When the sawgrass begins to put up new shoots, cattle are introduced. Cattle feed on the sawgrass preferentially. in this new environment, grass out-competes the sawgrass and becomes the dominant species. Because the area is no longer a wetland, as defined by the Corps, jurisdiction is lost for regulating subsequent development activities. The area is then developed for residential use.

Development of these lands is expected to have effects beyond the local loss of wetlands. The area is a prime recharge zone for the Biscayne Aquifer. There will be less water in storage to recharge the aquifer. Lowered groundwater levels will also

increase leakage under the dikes from the Conservation Areas. In order to protect the developed wetlands from flooding and provide an adequate water supply for residents, it will be necessary to backpump water from canals in the developed areas into the Conservation Areas. This water is likely to be of poor quality and will stress the Everglades ecosystem, which has naturally low levels of nutrients. In addition, development precludes any possibility of restoring the affected lands to serve as additional storage areas to expand the capacity of the water management system.

The area has been subject to extraordinary and controversial development pressure. Eastern Broward County has been intensively developed. The only extensive areas of open space remaining are to the west. In addition, the state and federal governments plan to build an extension of I-75 running south throught the lands at issue. This alignment was contested by local citizens groups concerned about degradation of freshwater resources and inducement of growth in the wetland areas of the county. Some believe the purpose of the alignment chosen was to increase property values along the route. A lawsuit filed to halt the project was defeated, partially on the basis that the Corps of Engineers would adequately regulate development in the areas to protect the wetlands.

Subsequently, the Corps of Engineers attempted, on two occasions, to issue a general permit covering the area. On September 15, 1978, the Jacksonville District proposed a general permit authorizing the discharge of fill in freshwater wetlands of Palm

Beach, Broward and Dade Counties generally lying east of the flood control levees.[150] The stated reasons for issuance of the permit were: (1) "properly conditioned permits can be issued to allow development while restoring and enhancing the waters of the United States and improving fish and wildlife habitat", and: (2) excessive time and manpower was being spent attempting to determine the jurisdictional limits of the Corps.

Several conditions would have applied to the permit: (1) 10% of the most productive wetlands of a site would have to be preserved for use as water retention areas and to filter runoff prior to discharge; (2) borrow pits would be limited to a depth of 6 feet and 1:5 side slopes; (3) the site would have to be inspected by the Corps prior to the commencement of work and the permit could be revoked if required by the public interest.

Opposition by local citizen's groups was the apparent cause for withdrawal of the proposal.

A second proposed general permit was announced May 21, 1980.[151] This proposed general permit would have covered a smaller area generally enclosed by SR 84 on the north, SR 94 (Kendall Drive) on the south, U.S. 27 and Krome Avenue (SR 27) on the west and urbanized lands to the east. It also authorized a more limited type of development: fill associated with single-family residences and residential developments of five units or less per acre.

A more complex set of conditions was proposed. The wetlands would first be classified and the amount of allowable fill restricted as follows:

Wetland Classification	Percent Allowable Fill
Highly stressed (invaded by 75% exotic plants)	80%
Stressed (40-75% invaded by exotic plants)	50%
Freshwater flat	50%
Transitional freshwater marsh	20%
Freshwater aquatic wetlands	individual permit required

Other conditions required a 3:1 slope on fill; construction of a littoral enhancement zone on excavated lakes or canals, with a 7:1 slope to a depth of 5 feet; retention of stormwater runoff in accord with local ordinances and discharge to open water bodies only through swales; and, no restriction to natural surface water flows could be created. No work could be performed until written plans had been approved by the District Engineer. This proposal was also withdrawn, apparently because of local opposition.

D. Limerock Mining, Dade County

1. General Discussion

Limerock mining is an economic activity that is putting considerable pressure on wetlands in South Florida, and particulary in Dade County. Limerock is widely used in South Florida as fill for construction projects and in the manufacture of concrete. Although there is substantial mining in other parts of the region, and the activity is likely to increase in other areas, Dade County has the best rock and is closest to the most feverish

construction activity. The high cost of land and the need to isolate mining from most other land uses because of blasting, equipment operations and the production of dust, has historically led mining companies to locate their operation on the periphery of urbanized areas. As upland sites have become developed, the mining companies have moved into wetlands. Examination of aerial photographs shows that a zone of rock mines is being created to the west of urbanizing lands. Several large new rock mines have been proposed in recent years and the trend of limerock mine developers seems to be to try siting them as far west as possible, into the Everglades.

Such development poses several problems. The rock that is removed from the pits, which may be 50 feet deep, is the structure of the Biscayne Aquifer. Removing the rock is removing the aquifer and replacing it with an open water body. Groundwater levels are thereby reduced, because the rock displaces a certain amount of water and therefore holds water levels at a higher level. In addition, that amount of water is subjected to continuous, year around evaporation. Water in the aquifer is protected from that kind of loss until it rises to the surface. Degradation of water quality is also possible. The problem here is not so much the mining, but subsequent development. Water quality impacts of mining are generally isolated to the mine site and quickly subside once mining ceases. Rockpits are attractive locations for residential development, however, which can quickly degrade water quality with urban runoff. The stockpiling of materials, the construction of access roads, and other filling

associated with development and operation of a mine also blocks surface water flows. In addition, limerock mining unavoidably destroys the native wetland community and whatever fish and wildlife values exist on the site. It is generally impossible to restore the native wetland community without replacing the limerock. But if substantial areas of wetland vegetation are recreated along the edge of the rockpits as a littoral zone, and urban runoff into the pits is avoided in the future, it appears that water quality could be maintained at a high level and the pits could become productive habitat for fish and wildlife.

The Corps did not begin to assert jurisdiction over the rockpits until 1978, acting on the basis of Phase III of the implementation schedule. The Florida Department of Environmental Regulation (DER) has had considerable difficulty asserting jurisdiction. As the exotic tree Malaleuca encroaches on wetland areas, DER loses jurisdiction over mining them unless the mines are connected to canals or waterbodies. In 1980, DER determined that much of the area east of the Dade Broward Levee was heavily infested by Malaleuca and that DER's jurisdiction over that area was doubtful. The Secretary of DER advised the mining companies that DER would not assert dredge and fill jurisdiction over mining east of the levee, but would require the miners to apply for groundwater discharge permits unless several best management practices, intended to protect water quality in the pits, were followed. Three of those conditions were similar to conditions imposed by the Corps, but one was opposite. DER required construction of a perimeter littoral zone, connected by sheetflow

to adjacent wetlands. One reason for that descrepency is that the Corps and other interested agencies were not notified or consulted regarding the decision to exempt mining in the area. Recent meetings between the agencies appear to have resolved the conflict, however. Berms will not be required in areas where the county would like to maintain natural condiitons. At the same time, DER will no longer grant an automatic exemption to rockpits east of the levee. The Corps, Dade County and the local field inspectors will be given an opportunity to inspect the site to determine whether Malaleuca have in fact invaded to such an extent as to divest the agency of dredge and fill jurisdiction.

Even where DER has jurisdiction, however, it has difficulty proving sufficient likelihood of water quality degradation to deny permits for mining in wetland areas. DER recently lost a case in which it tried to deny a permit to Florida Mining and Materials to mine south of the Tamiami Trail (US 41), 2 or 3 miles west of Krome Avenue (SR 27), just west of the levee (L-31). This site drains through the Shark River Slough and Everglades National Park. DER attempted to show that water quality would be degraded as the result of a loss of wetlands vegetation and that water quality standards for dissolved oxygen would be violated at the bottom of the 40 feet deep pit. A hearing officer held against the agency on those points. Although the area serves other important wetland functions, they were not considered in the case because DER's jurisdiction is limited to water quality considerations.

2. Capeletti[152]

The processing of a proposal by A. J. Capeletti to construct a rock mine may shed some light on the issues raised by mining limerock in the wetlands of Dade County and the influence of the Corps and related agencies in resolving them. Capeletti's original application, submitted in October, 1978, proposed excavating six rock pits over an area of 1.5 square miles of wetlands. He proposed removing 28,700,000 cubic yards of limestone--347 acres of wetlands would have been filled to local flood criteria by the discharge of 2,800,000 cubic yards of rock. The site is located about 3 miles north of the Tamiami Trail (US 41) and 3 miles west of the Florida Turnpike. Two of the proposed pits would have been located west of and adjacent to the Dade-Broward Levee, two would have been east of the levee and adjacent to it, and two would have been further east, close to an existing road. Interestingly, that road was constructed pursuant to the first Phase III permit issued in South Florida.

The original proposal would likely have caused numerous adverse impacts. Much of the site was high quality, viable sawgrass marsh, which improved in quality toward the western portions of the tract. There was a large tropical hardwood hammock occupying part of the site. Although an exotic, nuisance plant (Malaleuca) had begun to invade the site, this incursion was limited to the eastern portion. The remainder was important fish and wildlife habitat that would have been eliminated by the mining. The site was a known recharge area for the Biscayne Aquifer and was within the cone of influence of the

Metro-Dade Water & Sewer Authority's "Three-Square Mile" well field. When the well field began to pump 150 million gallons a day of potable water for the citizens of Dade County, groundwater would be drawn from the rock mining site into the wells. There was a significant possibility that the aquifer would eventually be contaminated by the introduction of pollutants via surface waters in the pits and the potable water supply of the County would be harmed. Sheet flow across the site would also have been detrimentally affected.

The substance of these problems was identified through the process of interagency coordination. The Fish and Wildlife Service played a major role in identifying adverse impacts and suggesting mitigating measures, but the United States Geological Survey (USGS), Florida Game and Freshwater Fish Commisison (FGFWFC) and the Metropolitan Dade County Department of Environmental Resource Management (DERM) also participated. The Florida Department of Environmental Regulation (DER) received copies of all comments and interagency memoranda, but appeared to play no role in negotiations. DER eventually issued a default permit, as mandated by Florida statute, after it failed to take any action within 90 days of receipt of a complete application.

In order for the Fish and Wildlife Service to participate, it was necesary to extend the comment period beyond the original 30 days that had been provided. The FWS felt the site merited extensive field investigations using an airboat, canoe and personnel that were unavailable during the original period. An extension of 75 days was granted over the objections of an

attorney and engineering consultant representing the applicant. The FWS used the additional time to make at least four field inspections of the site and analyze the impacts. It recommended denial.

After several meetings between the parties and discussion of possible mitigation measures, the applicant submitted a revised plan. The FWS rejected the plan as providing insufficient mitigation. Lengthy negotiations then ensued between the applicant and the FWS as to the proper technique for establishing relative habitat values. A joint habitat evaluation was eventually conducted using a four-man team composed of biologists from the Corps, the applicant, the FWS and the FGFWFC. Additional biologists from the FWS, the FGFWFC and an attorney representing the applicant observed. The results indicated that in order for the applicant to compensate for the loss of 100 surface acres of freshwater marsh, 392 acres of mitigation would have to be provided.

Negotiations between the applicant and the Corps eventually led to the acceptance of a drastically modified mining plan with substantial mitigation. The scope of mining was reduced from six pits to one pit, approximately 100 acres in size, located on the eastern side of the site closest to the road, in the portion most heavily invaded by Malaleuca. The compromise allowed the temporary discharge of sixty acres of fill for operation of the mine, with removal and restoration upon completion of mining. A 150 foot wide sloping shelf was to be constructed around the perimeter of the pit to provide substantial littoral zone under a

range of seasonal water levels. The mitigation plan would result in 60 acres of deep, open water habitat surrounded by 75 acres of littoral zone, constructed in 100 foot wide cells as mining progresses.

A permit was issued by the Corps on May 19, 1980, after 20 months of complex negotiation and review, authorizing work in accord with the compromise plan. If mining and restoration are conducted according to that plan, it appears that limerock might be removed from the site without any loss to society of fish and wildlife values and without threatening the regional water supply with contamination. It appears likely the site would have been further stressed, in the absence of mining, by the drawdown of water levels associated with the new well field and a resulting increased Malaleuca invasion. The mitigation plan may, therefore, have resulted in a net, longterm benefit to fish and wildlife values. The primary danger now is that mitigation might not be accomplished as permitted or that in subsequent years economic pressures might lead to a filling of the mitigation areas and the construction of residential or commercial buildings adjacent to the water. At least two rock pits near the Miami International Airport are currently being filled to accommodate additional warehouse space.

3. Florida Rock Industries[153]

An example of a permit application that was denied by the Corps is the proposal by Florida Rock Industries, Inc. to locate a limerock mine 1.5 miles north of the Tamiami Trail (US 41), east of Krome Avenue (SR 27), about 2 miles east of the

Dade-Broward Levee. The area is prime wetlands.

The company had first begun to mine without a permit. An enforcement action resulted in a cease and desist order and restoration. The company then applied for a permit to mine 98 acres--a 53 acre pit, with the rest used to stockpile material. The permit was denied in October, 1980. The Corps has recently been sued for $85 million in connection with this action.

Field investigation by the Corps and the FWS indicated the site was a highly productive wetlands habitat. It had not been highly stressed and there was only sporadic invasion by Malaleuca. It stored and absorbed flood waters, reduced flood heights, improved water quality by plant and bacterial utilization of nutrients and recharged the Biscayne Aquifer. Mining would have converted this biologically rich and productive area into an open water body with reduced biological value. Alternative, less biologically productive sites were available for rockmining. The Corps thus denied the permit.

E. The East Everglades, Dade County

1. The East Evergaldes Resources Planning Project

A team representing several local , regional, state and federal agencies recently prepared a management plan for 242 square miles of wetlands in western Dade County.[154] The steering committee for the project included representatives of the Dade County Planning Department, the Dade County Department of Environmental Resources Management, the South Florida Water Management District and the Everglades National Park. A Residents and Property Owners Advisory Committee and a Citizens

Advisory Committee also participated. The study was completed in October, 1980 and was largely financed by the U.S. Environmental Protection Agency.

The participating agencies shared concerns relating to the potential impacts of development in the East Everglades on fresh water resources, vegetation and wildlife. The East Everglades is a major contributor of flow to the Everglades National Park, an important recharge area for the Biscayne Aquifer and a vital source of fresh water for holding back salt water intrusion along the coast.

An intensive assessment was conducted of the area's environmental characteristics: surface and ground water, vegetation, wildlife, soils and sediments, land use, and climate. The team analyzed in detail the relationships between these environmental characteristics, the constraints they posed for development and management objectives for the area. The conclusions of the study are summarized below.

Surface Water -- Surface water is the most essential element in maintenance of the ecosystem. Most of the area is inundated for significant portions of the year. Water flows generally south and southwest through several distinguishable subareas: the Northeast Shark River Slough, the Rocky Glades, Taylor Slough and the Southeast Saline Everglades. Flooding is essential to maintenance of vegetation, soils, wildlife, estuarine resources, ground water recharge and the inhibition of salt water intrusion. Flooding also constrains residential and agricultural land uses throughout the area to different degrees depending on stage and

duration. Because of the extremely porous limestone in the East Everglades, structural flood control measures are technically infeasible. In addition, the existing wetland system maintains water quality.

Ground Water -- Ground water is directly tied to surface water in the East Everglades because the limestones of the area are so porous. Maintenance of wetland conditions is therefore necessary for maintenance of ground water levels, which in turn is necessary to prevent further salt water intrusion. Ground water quality is sensitive to degradation as the result of surface activities.

Vegetation -- The native vegetation of the East Everglades is predominately wetlands such as marshes, prairies and thickets. In addition there are scattered hammocks with tropical vegetation. About 10% of the area has been disturbed by severe fire, clearing or invasion of exotic plants. Vegetation is crucial to wildlife. Plant communities also maintain water quality. In turn, plant communities depend on maintenance of the flood regime and protection from clearing, filling or similar disruptions that would permanently alter the composition of species. The grassy communities that occur in much of the area are naturally subject to periodic fire and maintained by its occurrence. Fire hazard, as well as the need to maintain water levels and minimize clearing, is a contraint to development.

Wildlife -- Many species of valuable and unique wildlife occupy the East Everglades. The most important factors affecting

them are water, vegetation and human activities. Protection of wildlife is a constraint on most types of land use.

Soils and Sediments -- A variety of soils and sediments are found in the area. These are closely related to hydrologic charactertistics, vegetation and land uses. Peat soil has severe constraints for traditional agriculture or residential use. Rock can be broken up with heavy machinery and used as a substrate for planting.

Land Use -- Only about 12% of the land in the East Evergaldes has been developed and very little of that is in residential use (.25% of the study area). Most of the developed land is used for agriculture. Most of the area is used for recreation.

Climate -- The area has mild, dry winters and hot, wet summers. Of the 55-60 inches of average rainfall per year, 85% (50 inches) occurs during a summer rainy season from short, intense thunderstorms. The area is also subject to hurricanes. 90% of the water in the East Everglades comes from local rainfall. 85% of the rainfall (50 inches) returns to the atomosphere through evapotranspiration.

The objects of the study were as follows:

Water Quantity

A. Maintain a pattern of water periodicity and a quantity of water in the East Everglades which will insure a sufficient water supply for users in south Dade County and the south Florida region, and prevent further salt water encroachment.

B. Maintain a pattern of water periodicity and a quantity of water in the East Everglades which will protect the biological health of the natural wetland environments within and downstream from the study area.

Water Quality

A. Protect the water quality characteristics of surface and ground waters to ensure the future availability of clean water for public and private water supplies in south Dade County.

B. Protect the water quality characteristics of surface and ground waters in the East Everglades to ensure the biological health for the native flora and fauna within and downstream from the study area.

Natural Features

A. Protect the existing natural wetland functions and characteristics of the East Everglades and restore functions and characteristics where practicable, in order to preserve the biological productivity, animal and plant habitat, and natural biotic diversity.

B. Protect the aesthetic value of the natural environment in the East Everglades.

C. Protect unique natural features of the East Everglades study area.

Land Use

Preserve the use of land by private property owners consistent with the protection of Dade County and Everglades National Park water supplies and the public health, safety, and welfare.

In order to attain these objectives in the East Everglades a complex managmeent plan was developed. The plan is premised on two key facts:

First and foremost is the fact that the East Everglades is a wetland. It is the floodplain of the historic River of Grass. The heart of Shark River Slough flows through the East Everglades and Taylor Slough is born here. Although these natural systems have been affected by water management in the recent past, the East Everglades was a floodplain and wetland for some 10,000 years before Henry Flagler's railroad reached Miami.

The second basic fact leading to the recommendations in this plan is that floodplains and

> wetlands are inappropriate locations for people to build homes. The danger to life, the public health problems, and the great public expense that inevitably accompany rural residential development of remote wetlands have combined to establish a record that is recognized at every level of governmental authority in this country. Many of the Federal, State, regional, and local regulations and policies recognizing the unsuitability of floodplains and wetlands for residential development are presented in Chapter IV of this report. Principal among these laws and policies are the president's Executive Orders on floodplains and wetlands, and Congress' directives for the evaluation of permit applications for filling of wetlands contained in the Federal Water Pollution Control Act and Amendments.

Accordingly, the management plan places severe constraints on the development of the East Everglades for residential use. A maximum density of 1 unit per 40 acres is established for most of the area. However, no roads may be constructed in permanent wetlands. Some of the drier portions of the area, particularly lands that have been previously disturbed, may be used for agriculture. Three basic managment areas were delineated and best management practices for regulating development of those areas were developed. Each of the various agencies active in resource management in the area was assigned specific responsibilities for implementing the plan. Success of the plan probably depends on each agency performing the assigned responsibilities. Dade County, for example, was to adopt new zoning districts, adopt a site alteration overlay ordinance, create a system of transferable development rights and continue to regulate obstructions to surface water flows under an existing ordinance. The Department of Environmental Regulation was assigned to continue regulating dredge and

fill in the area and revise water quality standards applicable in the East Everglades. The plan expressly contemplated the Army Corps of Engineers would continue regulating the discharge of fill material under authority of Section 404.

2. Enforcement of Section 404 in the East Everglades

Two Section 404 enforcement actions arising in the East Everglades area illustrate application of the program to protect a sensitive wetland from damaging development. The two cases that will be discussed are United States of America vs. Russell Carter, Jr.,[155] and United States of America vs. Thomas San-Cartier.[156] Both defendants have been convicted of illegal filling and are awaiting a restoration hearing.

Russell Carter was Chairman of the Residents and Property Owners Advisory Committee for development of the East Everglades plan described above. His wife owned approximately 120 acres classified as seasonal wetlands by the plan, with residential development to be discouraged. Nevertheless, Carter began to develop and sell five acre lots for homesites by constructing a road and filling 1/2 acre fill pads with crushed rock. Carter conducted these activities despite notification of the need to obtain a Section 404 permit and continued them despite a Cease and Desist Order. It was necessary for an armed marshall to serve notification of a pending hearing on a Temporary Restraining Order on Carter. He continued to fill after receiving it.

Cartier was similarly recalcitrant. He reportendly threw one official into a pond with his pet alligator and continued filling

after receiving two Cease and Desist Orders from the Corps and an Order from the U.S. District Court. Cartier filled 4 or 5 acres in the same general area as Carter for the purpose of establishing a mango grove.

The prevalent vegetation on both sites was sawgrass and a periphyton algal mat, indicating they were wetlands. Although Cartier's land had been previously plowed, wetland vegetation had reestablished itself. The subject properties were located in the drainage of the Shark River Slough. In order to establish jurisdiction for an individual permit, the Corps showed the Shark River Slough has an average annual flow in excess of 5 CFS. The Shark River Slough, in turn, was treated as a watercourse connecting to the Gulf of Mexico.

The District Court made extensive findings of facts relative to the importance of the subject wetlands and the potential impacts of the defendants' filling of those wetlands. Relevant passages are quoted below.

> 5. The East Everglades area, of which the subject propeties are a part, is the flood plain for the historic "river of grass" in South Florida and has been designated by local ordinance as an area of critical environmental concern. This area in its present natural state plays several vital roles in the life support systems of South Florida:
>
> > A. Flood Storage. The East Everglades historically and presently functions as a flood storage area for Dade and Monroe Counties, retaining large quantities of surface water during flood periods.
> >
> > B. Water Quantity. The East Everglades serves as the water recharge area for the Biscayne Aquifer which underlies the East Everglades. The Biscayne Aquifer serves as the sole source of Dade County and Monroe County drinking water supplies. All well

fields for Dade and Monroe Counties tap into the Biscayne Aquifer. The subject propeties are located above many of these well fields and it is possible for pollutants to enter the Aquifer at defendants' properties and then be carried to the Dade County public well fields.

C. Surface Water Supply. The East Everglades is directly upstream from the Everglades National Park. The entire Everglades system depends upon the seasonal supply of surface water flowing from the East Everglades into the Park.

D. Water Quality. The East Everglades acts as a natural filter system to maintain a high degree of water quality to the Biscayne Aquifer (and thus to public drinking water suplies) as well as the Everglades National Park. As a recharge area, it provides sufficient fresh water to the aquifer to maintain a fresh water hydraulic head which prevents intrusion of salt water from Biscayne Bay and thus preserves our water quality.

E. Wildlife Habitat. The East Everglades area serves as the habitat for numerous surviving rare and endangered wildlife species.

12. The fill activities on both of the subject properties and their attendant development have the potential for contaminating the Biscayne Aquifer and posing a threat to the drinking water supplies of Dade and Monroe Counties. The Dade County Public Health Department studied 36 private wells in the East Everglades. In reports dated September 18, 1981 and October 22, 1981, the Dade Countty Public Health Director reported a high incidence of water pollution in the East Everglades, to wit: "27 out of 36 samples collected show the presence of fecal and/or total coliform contamination of the groundwater in the East Everglades area."

A. The subject properties are only 3 miles away from the area of the tested wells.

B. The ground water contamination had occurred in an area where the average density was only 1 house per 20 acres, as opposed to the 1 house per 5 acres density proposed by the defendant Carter.

C. Based upon the ground water sampling in the developed area the Dade County Public

Health Director determind that the groundwater in the East Everglades area was unfit for drinking and that water was to be boiled before using.

D. This contamination was the result of a single flood in an area still only sparsely populated. Plaintiff's groundwater hydrologist, Garald Parker, the discoverer of the Biscayne Aquifer, emphasized that this contamination was a forewarning of what ultimately was to be the fate of the entire water supply of South Florida if the East Everglades became even mildly urbanized.

13. The following environmental damage either exists, or is threatened as a result of defendant's fill activities.

A. The presence of the fill constitutes an adverse influence to fish and wildlife values in an area designated as environmentally critical.

B. The presence of the fill reduces the capacity of the area to store and absorb storm and flood waters.

C. The presence of the fill disrupted the natural drainage characteristics of the subject property and constitutes a physical obstruction for the transport of organic and nutrient material into the Shark River Slough and eventually into the Gulf of Mexico.

D. The presence of the fill reduces the area's capacity to recharge the Biscayne Aquifer and increases the potential for salt water intrusion into the Biscayne Aquifer.

E, The presence of the fill reduced the area available for filtration and purification of waters.

F. The presence of the fill destroyed valuable wetlands vegetation and habitat. The wetland vegetation serves as the food source base for all aquatic organisms in wetlands in the East Everglades and Shark River Slough. Loss of these plants on the sites of the fill pads constitutes a loss of food source for aquatic organisms and those animals which prey upon aquatic organisms.

The Corps of Engineers took the lead in stopping this activity. Although valuable wetlands were being destroyed, DER was unable to establish dredge and fill permitting jurisdiction over the activities of either Carter or Cartier because their sites were enclosed by a perimeter road (constructed subsequent to 1972 but grandfathered under Corps regulations) enclosing several square miles of wetlands. DER was thus unable to show continuous, contiguous wetlands vegetation between the sites of dredging and filling and the Gulf of Mexico. DER was only able to obtain jurisdiction over Carter for violation of solid waste disposal reguations because he apparently used a dead cow and "other putrescent material" as part of his fill. Corps jurisdiction is not cut off by the presence of a road, dike or other man-made barrier. In addition, it should be noted that Dade County waited until 2 months after the Corps took action to file a lawsuit.

The United States sought a permanent injunction against further filling, civil penalties and total restoration of the two sites. After a week long hearing, the Court granted the injunction but is awaiting the presentation of further evidence and argument before ruling on the remedies. The Corps is seeking total removal of all fill. Even that action will not restore the land to its natural condition. Voids between pinnacle rock formations have been filled and it would be infeasible to remove the fill without destroying those formations. The proposed restoration plan is, therefore, for the defendants to remove as much fill as possible by scraping the surface of the pinnacle rock

formations. The land would then be rock plowed to break up the pinnacle rock and additional material would be removed to lower the surface another couple of feet. Wetland vegetation would then be allowed to reestablish itself. Although such a technique has never been tried before, it seems the most practical method.

F. Marco Island

The history of development of Marco Island by the Deltona Corporation illustrates how more stringent review by the Corps in recent years of coastal wetlands conversions has resulted in the protection of important public resources.[157]

Marco Island was a pristine barrier island located on the Gulf of Mexico south of Naples. A complex of mangrove wetlands, uplands, tidal creeks and open water bodies lay behind the barrier beach. In 1964, the Deltona Corporation began to acquire acreage in the Marco Island complex for the purpose of creating a massive, new community. Deltona eventually acquired 24,962 acres at Marco Island. It initially acquired about 10,000 acres, planning to develop 8,509 acres for the community. Much of the land purchased by Deltona was wetlands or submerged lands. Development was to be accomplished by dredging and filling to create a system of finger-fill canal lots.

The original development was divided into five, phased construction areas: Marco River, Roberts Bay, Collier Bay, Barfield Bay and Big Key. Subdivision plats for the entire development were approved by Collier County by 1965 and Deltona began to sell lots through nationwide marketing. Development of the Marco River unit began in 1964, pursuant to permits issued by the

Corps of Engineers under the Rivers and Harbors Act. Although the development involved substantial conversion of natural wetlands to residential canal lots, the Corps routinely granted approval. State and county permits were also issued. The only criterion for permit review at that time was an assessment of the impacts on navigation. The results may be clearly seen in satellite imagery of Marco Island.

The next unit slated for development was Roberts Bay. In 1968, county and state approvals were again routinely granted. The Corps, however, had adopted expanded criteria for "public interest review" and the Fish and Wildlife Service objected to issuance of the permit. Although the Corps issued the permit, it was subject to the express condition that future permits could be denied and that Deltona was to restrict lot sales for the remainder of the land to areas within a state approved bulkhead line (a limit to encroachment on submerged lands). Deltona, however, had already sold 84% of the lots in Collier Bay, 70% in Big Key and 28% in Barfield Bay.

In about 1972, Deltona applied to the State for dredge and fill permits in Collier Bay. A review was conducted of Deltona's ownership interests in the remaining three areas. There appears to have been considerable debate whether Deltona owned much of the land it claimed. Submerged lands are generally owned by the State. This controversy was settled by agreement with the Trustees of the Internal Improvement Trust Fund (TIITF), i.e. the Governor and Cabinet. Deltona agreed to deed 4,032 acres of wetlands to the State for preservation and the State agreed to

issue Chapter 253 dredge and fill permits for the remaining three phases of development.

In 1973, Deltona applied to the Corps for a Section 10 permit authorizing construction in Collier Bay, Barfield Bay and Big Key. Because Section 404, enacted in 1972, requires certification by the State of compliance with water quality standards, processing was delayed. By the time the State issued a water quality certification in 1974, the Corps had adopted a new policy for evaluating permit applications that gave much greater weight to wetland values. Section 404 had also extended the jurisdiction of the Corps and the regulations were amended in 1975 to reflect that fact. In addition, EPA adopted guidelines for reviewing permit applications in 1975.

Deltona was thus forced to apply for permits under both Section 10 and Section 404 and considerably expanded criteria were used to evaluate the proposal. The permits were first reviewed by the District Engineer who concluded that a permit should be granted for Collier Bay, but that permits for Barfield Bay and Big Key should be denied. The District Engineer proposed issuing the permit for Collier Bay because substantial dredging and filling had already occurred and only 113 acres of mangrove wetlands remained. The decision was therefore made to allow Deltona to complete the development of that portion. The Barfield Bay and Big Key applications, proposing the destruction of 2,152 acres of mangroves and 735 acres of bay bottom, were denied. The Fish and Wildlife Service and the Environmental Protection Agency opposed issuance of the Collier Bay permits,

however, and the decision was elevated, pursuant to existing memoranda of understanding, to the Division Engineer for resolution of the conflict. The Division Engineer recommended issuing all three permits to relieve the hardship to Deltona. The decision was again elevated to the Chief of Engineers to resolve the objections of the federal agencies.

After review of the permit file, and consultation with the national offices of the Fish and Wildlife Service, the National Marine Fisheries Service and the Environmental Protection Agency, the Chief of Engineers agreed with the District Engineer.[158] The rationale for his decision, in essence, was that the wetlands that would be destroyed performed functions important to the public interest and that the benefits of the proposed development did not outweigh the loss of those functions.

The Chief of Engineers based his decision, in large part, on the "national factors of the public interest" set forth in 1) the FWPCA; 2) the Environmental Protection Agency guidelines, and; 3) the Corps' own guidelines. Section 101 (a) of the FWPCA Amendments of the 1972 established as the objective of the Act "to restore and maintain the chemical, physical, and biological integrity of the nation's waters." The relevant EPA guidelines stated that "From a national perspective, the degradation or destruction of aquatic resources by filling operations in wetlands is considered the most severe environmental impact covered by these guidelines."[159] The Corps' regulations stated: "As environmentally vital areas, they (wetlands) constitute a productive and valuable public resource the unnecessary altera-

tion or destruction of which should be discouraged as contrary to the public interest."[160]

The Chief of Engineers determined that the wetlands involved served "important natural biological functions," and that the permits must be denied unless "the benefits of the proposed alteration...outweigh the damage to the wetlands resource." Further, the proposed alteration (must be) necessary to realize those benefits." The Chief stated that the wetlands involved in these cases were the types of wetlands identified in the Corps regulations as "important to the public interest":

> These include wetlands that serve important natural biological functions (including food chain production, general habitat, and nesting, spawning, rearing and resting sites for aquatic or land species); wetlands set aside as sanctuaries or refuges; wetlands which are significant in shielding other areas from wave action, erosion, or storm damage (including barrier beaches); and wetlands that serve as valuable storage areas for storm and flood waters.

According to the Chief, the basic purpose of the proposed development was housing, and that "in order to fulfill its basic purpose, housing generally does not have to be located in a water resource." He concluded that the proposed housing and recreational development, "which will result in almost total destruction of these wetland areas, is an unnecessary destruction of this wetland resource. The Chief noted that in making his decision he considered the opinions of the District Engineer, the EPA, the U.S. Fish and Wildlife Service, and the National Oceanic and Atmospheric Administration of the Department of Commerce, who all concluded that the proposed dredge and fill activity would "constitute an unacceptable adverse impact on the

aquatic resource."

In concluding, the Chief of Engineers stated that he did not believe his decision constituted a "taking" of private property. He also wrote that he did not believe Deltona had grounds for an estoppel argument against the Corps. (In general, estoppel can not be raised against the U.S. government.) The basis for this belief was the condition set forth when the Corps issued Deltona's "Roberts Bay" permit. The condition specified that the issuance of the permit did not necessarily mean that any future permit applications would similarly be granted. Thus, the Corps could not be estopped from denying the later permits.

Deltona appealed the Corps' decision to the Court of Claims and to a federal district court. Both courts upheld the Corps' decision.

On January 14, 1981, the District Court of the Middle District of Florida held that the Corps' decision was neither "arbitrary nor capricious," and that the Corps acted in a "careful, reasoned and lawful manner."[161] The court also held that the Corps complied with its own regulations and did not deny Deltona procedural due process.

Deltona claimed it was also denied substantive due process by the retroactive application of EPA guidelines. The court found no prejudice because the EPA guildelines were the "same as the already existing Corps guildelines on the wetlands."

The court further held that the government can not be estopped in the absence of the "affirmative misconduct," and that Deltona alleged nothing that constituted "affirmative

misconduct." The Corps' knowledge in 1964 of Deltona's overall plan did not estop the Corps from denying the permits, "especially in light of the explicit language of" the condition imposed on the Roberts Bay permit. This condition provided that the issuance of the Roberts Bay permit did not necessarily mean that any future permits would be granted. Finally, the court stated that Deltona's claim that the Corps had no jurisdiciton was "clearly without merit."

On each of the above issues the court held there was no material issue of fact in dispute and that the Corps was entitled to Summary Judgement as a matter of law.

The issue in the Court of Claims was whether the Corps' action constituted a "taking" of Deltona's property. After a thorough review of the law of takings, the court concluded there was no taking.[162]

The court first determined that the statutes and regulations applied by the Corps "advance legitimate and important governmental interests." Further, the court found that although there was some diminution in the value of Deltona's land as a result of the Corps' action, the Corps did not "deprive Deltona of the economically viable use of its land." Further, "Deltona's remaining land uses are plentiful and its residual economic positon very great." To support its holding, the court noted that the Supreme Court "has squarely held that mere diminution, standing alone, is insufficient to establish a taking." In other words, the Corps' decision did not deprive Deltona of other economically productive uses of its land. Although Deltona may have been

denied the "highest and best use" of its land, other uses remained. The Corps may have left Deltona in a "difficult situation, legally and financially," but the Fifth Amendment "does not provide a solution." The court also noted that Deltona bears "a great deal of responsibility for its current plight" by disregarding the condition attached to the Roberts Bay permit, and selling many of the lots before having obtained the necessary permits. In sum, the court wrote that "in view of the many remaining economically viable uses for plaintiff's property, and the substantial public beneifts which the new statutes and regulations serve to bring about, we have concluded that no taking occurred."

Meanwhile, in 1978, Deltona submitted a new application to both DER and the Corps for permits necessary to develop its remaining lands at Marco Island. After several modifications reducing the amount of wetlands that would be developed, the proposal still would have involved the dredging and filling of 2,500 acres of open water, mangrove swamps and fresh water wetlands. This time the Corps agreed to issue a permit, but DER issued a Notice of Intent to Deny. Deltona then brought an action for administrative review and a rule challenge contesting the constitutionality of Chapter 403, Florida Statutes and the validity of DER's implementation.

By 1982, Deltona was involved in litigation with numerous public and private parties. In order to allow development to proceed and at the same time guarantee protection for most of the wetlands involved, all of the non-federal parties have agreed to

a settlement.[163] The parties to the settlement are the Deltona Corporation, the Department of Environmental Regulation, the Trustees of the Internal Improvement Trust Fund, the Department of Veteran and Community Affairs, the South Florida Water Management District, the National Audubon Society, the Florida Audubon Society, The Collier County Conservancy, the Environmental Defense Fund and Collier County.

The settlement provides for an exchange of land between Deltona and the State. Deltona agreed to donate 15,000 acres of wetlands for preservation and the state agreed to give Deltona 150 acres of prime industrial property near Miami International Airport. The industrial property will be sold by Deltona to finance development of 14,500 residential units on less sensitive lands near Marco Island. The parties have agreed not to contest issuance of federal permits and it appears likely the Corps will issue a permit consistent with the settlement agreement. Wetland loss has been limited to about 600 acres. (250 acres of sand barrens, 165 acres of mixed grasses, 159 acres of mangroves and 29 acres of open water). Deltona will be able to sell only 5,000 units fewer than originally planned.

VII. Conclusion

The Section 404 regulatory program administered by the Corps of Engineers appears to be the most effective check on harmful wetlands conversions that currently exists in South Florida. As the case studies have shown, most permits for harmful activities are being denied. Perhaps more importantly, the credibility of the program has become established to the point that developers who might otherwise propose highly damaging projects do not even bother to apply for permits because they expect denial. Alternative plans are therefore made before attempting to secure development approvals. It seems to be generally understood, and accepted, for example, that extensive destruction of mangroves for residential housing will not be allowed. Consequently, few applications are received for such work despite the prevalence of such activity prior to 1972.

An example of the type of project that no developer would seriously propose under the existing regulatory program is Golden Gate Estates.[165] Golden Gate Estates is a massive land sales subdivision covering approximately 175 square miles of the Big Cypress Swamp in Collier County. During the 1960's and early 1970's, the Gulf American Corporation excavated 183 miles of canals and constructed a grid system of poor quality roads spaced at one-quarter mile intervals. The canals were connected to Naples Bay and Fahka Union Bay. Over 50,000 residential lots were sold to purchasers worldwide through high-pressure, deceptive sales techniques.

The development has had devastating environmental impacts.

The duration and depth of flooding has been severely reduced, destroying native wetland plant and animal communities and increasing the incidence and intensity of fires in the area. Groundwater recharge has been reduced, threatening regional water supplied, and the quality of surface waters has been degraded. Because the canals divert sheet flow into a channelized system, the productivity has been reduced of estuarine areas that would have normally received fresh waters from the natural wetland system. Instead, water enters the estuary as pulse discharges of polluted water, severely degrading the system. Fortunately, very little of Golden Gates Estates has been actually occupied by lot purchasers. Adverse impacts would be greatly increased by buildout. Several reasons why occuation has been minimal thus far are that lots are far from Naples, the closest center of employment, roads are deteriorating and utlities are lacking. Perhaps the most influential factor is that much of the area is subject to regular flooding despite the canal system. Thus, although the canal system is causing extreme damage, it has failed to make most of the area suitable for residential development. The Corps is currently studying the feasibility of restoring Golden Gate Estates to correct these mistakes. Most significantly, however, no similar projects have been constructed since the Corps began enforcing Section 404.

A further indication of the effectiveness of Section 404 is that projects that are permitted are frequently substantially modified to protect important wetland values. The rockpit and Marco Island cases discussed above are good examples of projects

that were substantially modified as a result of Section 404 permitting.

There are several reasons for these relative successes. The Clean Water Act and related legislation such as the Fish and Wildlife Coordination Act give the Corps a broad mandate to regulate the discharge of materials into wetlands. In considering the effects of such discharges, the Corps has not been limited to water quality considerations, but has been responsible for evaluating effects on a full range of wetland functions and values. Corps staff administering Section 404, particularly those in the field, seem highly competent and dedicated to the goals of the program. Other federal agencies, most notably the Fish and Wildlife Service, have provided excellent professional assistance to the Corps. Excellent legal assistance has been available for enforcement and federal judges have been supportive. Furthermore, attorneys enforcing Section 404 cases have been able to readily obtain the services of independent expert consultants. Success in such legal actions frequently depends on the quality of expert testimony that is available.

Despite the relative success of Section 404 in South Florida, it is apparent that substantial conversion of wetlands is occurring. The general trend seems to be for urbanization to occur on agricultural lands, which then displaces agricultural activity into wetlands. In addition, although large scale wetland developments such as Golden Gate Estates or Marco Island are not currently being permitted, substantial development of wetlands for urban use is occurring.

Much of the wetland development that is occurring is exempted or is otherwise not subject to the jurisdiction of the Corps as the Corps interprets and applies Section 404. An unkown but potentially large amount occurs in violation of permitting requirements. The Corps has limited ability to detect violations. A considerable amount of wetland development occurs pursuant to general permits, although the acreage involved is not known. Finally, permits are frequently issued allowing wetland development. These problems will be discussed below.

The jurisdiction of the Corps is limited to regulating the discharge of dredged or fill material. Most of the wetland destruction occurring in South Florida, however, is accomplished by the construction of drainage projects. Wetlands are usually drained by excavating canals and installing pumps. Except to the extent that fill might be deposited incidentally in wetlands, the Corps does not exert jurisdiction over such activities. Further, the Corps generally refrains from exerting jurisdiction over excavation and land clearing projects that would be subject to regulation through literal interpretation of the term "discharge". A dragline bucket, for example, that "drips" dredged materials as it is removed from the excavation could be treated as a point source discharge. Wetland clearing operations can result in a discharge of fill. Judicial decisions support such interpretations.[166] The Corps, however, adheres to a more limited view of its regulatory jurisdiction.

Another limitation on effective regulation is the use of general permits. Activities allowed by general permit generally

do not receive close regulatory scrutiny. The Clean Water Act allows the Corps to issue general permits for

> any category of activities involving discharges of dredged or fill material if the Secretary determines that the activities in such category are similar in nature, will cause only minimal adverse environmental effects when performed separately, and will have only minimal cumulative adverse effect on the environment.[167]

In addition, general permits are supposed to be based on the Section 404(b)(1) guidelines promulgated by EPA.[168] It seems doubtful the general permits that have been issued meet these criteria. The cumulative effect of filling wetlands above "headwaters", for example, would be devastating in South Florida. Nor does there seem to be any scientific bases for concluding that a discharge of fill above "headwaters" will "cause only minimal adverse environmental effects when performed separately".

Although the cumulative impacts of development are suppposed to be considered in evaluating permit applications, in practice permits are not denied unless substantial, individual adverse impacts can be shown. The Corps thus finds it difficult to deny small projects such as fill for individual home sites. Minor projects, however, set a precedent that is used to justify granting permits for additional projects in the area. Eventually, an entire area will be more or less "written off". Much of the wetland loss in South Florida proceeds by such a piecemeal approach. The wetland resources of the region are being "nibbled" away.

There seem to be four basic reasons why cumulative impacts are not given adequate consideration. First, it is politically

difficult to deny permits for small landholders. There is tremendous pressure to give "Mom and Pop" a permit to fill their lot. Second, there is legal pressure to give every landowner the right to fill at least a portion of his property. Third, there is a lack of good scientific studies, based on adequate field investigations, projecting the cumulative effects of development. Fourth, there is inadequate staffing to analyze cumulative effects.

The difficulty of effectively enforcing Section 404 is another problem. Unless developers can be forced to restore wetlands they have illegally filled, they have little to lose and much to gain by ignoring the regulatory program. If a developer can fill wetlands, apply for an after the fact permit and pay a nominal fine plus attorneys fees, there is enormous incentive to violate the rules. If the developer faces the certain risk of having to restore the wetlands, gaining no profit and bearing substantial expense, there is incentive to comply with the rules. Unfortunately, it is very difficult for the Corps to force restoration. A restoration hearing must be held and the judge balances a number of equitable considerations in determining whether to order restoration. Some strengthening of the restoration remedy would greatly assist enforcement. Restoration, for example, might be required by law absent exceptional circumstances.

The basic problem, though, with Section 404 is that the U.S. Army, in administering this program in South Florida, is fighting a rearguard, defensive action. It can only try to prevent the

loss of valuable wetlands; it never regains any. When the Corps wins a battle, the status quo is maintained. When it loses, additional wetlands are lost. The natural environment is thus in constant retreat.

NOTES

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4 Id.

5 Id.

6 Id.

7 Id.

8 Id.

9 Id.

10 Heath and Conover, Hydrologic Almanac of Florida, 149-153 U.S.G.S., Open File Report 81-1107.

11 This is the Ghyben-Herzberg principle. See generally, Maloney, Plager and Baldwin, Water Law and Administration: The Florida Experience, 149 (1968) [Hereinafter Water Law and Administration].

12 A photograph of this well is reproduced in A. Parks, The Forgotten Frontier (Banyan Books).

13 See generally, U.S. Dept. of Interior, Environmental Impact of the Big Cypress Swamp (1969).

14 E. J. Heald, The Production of Organic Detritus in a South Florida Estuary, Ph.D. dissertation, University of Miami, Coral Gables, Florida (1969); W. E. Odum, Pathways of Energy Flow in a South Florida Estuary, Ph.D. dissertation, University of Miami, Coral Gables, Florida (1969).

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18 Ch. 84, 9 Stat. 519.

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20 Id., 47-52.

21 Id., 56-57.

22 The South Florida Study, supra note 2.

23 Id.

24 Id.

25 National Wetlands Inventory, U.S. Fish and Wildlife Service (unpublished data).

26 Interview, Stanley K. Smith, Population Program Director, Bureau of Economical Business Research, University of Florida (August 24, 1982).

27 1981 Florida Statistical Abstract, 223.

28 Telephone interview, Elicia Pryor, South Florida Water Management District, West Palm Beach, Florida (August 24, 1982).

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30 Overview of Florida's Water System, supra note 1.

31 Id.

32 Carter, supra note 2 at 85, citing J.H. Davis, "The Peat Deposits of Florida," Florida Geological Survey Bulletin 30 (1946), 247 pp.

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34 U.S. Dept. of Justice, U.S. Attorney, Southern Distirct of Florida, Press Release (July 16, 1982).

35 East Everglades Resource Planning Project, Proposed Management Plan for the East Everglades (1980).

36 South Florida Study supra note 2.

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38 Carter, et. al., Ecosystems Analysis of the Big Cypress Swamp and Estuaries (EPA, 1973).

39 T. Thomas, A Detailed Analysis of Climatological and Hydrological Records of South Florida with Reference to Man's Influence Upon Ecosystem Evolution, Rep. to U.S. National Park Service, 82 (1970), cited in Eisenbud supra note 2 at 56-57.

40 Coordinating Council on the Restoration of the Kississimmee River Valley and Taylor Creek-Nubbin Slough Basin, Symposium Summary, Regional Influence of Drainage on the Hydrologic Cycle in Florida (July, 1982) 42 pp.

41 33 U.S.C. §403.

42 P.L. 92-500, subsequently amended and renamed the Clean Water Act of 1977, P.L. 95-217.

43 Section 301 of the Act prohibited discharge of pollutants into waters of the United States without a permit. Section 404 gave the responsibility for permitting certain discharges to the Corps of Engineers. Section 404 is codified at 33 U.S.C. §1344. Corps regulations for implementating Section 404 are codified at 33 CFR Parts 320-330. These regulations were altered as this reprot was being completed. 47 Fed. Reg. 31794-31834 (July 22, 1982). The changes are not analyzed.

44 33 U.S.C. §1362(7).

45 33 U.S.C §1251(a).

46 The pertinent Conference Report explains,

> [T]he conferees fully intend that the term navigable waters be given the broadest constitutional interpretation unencumbered by agency determinations which have been made or may be made for administrative purposes.
> S. Rep. No. 1236, 92d Cong. 2d Sess. 144 (1972).

47 392 F. Supp. 685 (D.D.C. 1975). See also, U.S. v. Holland, 373 F. Supp. 665 (M.D. Fla. 1974).

48 40 Fed. Reg. 31319 (1975).

49 P.L. 95-217.

50 42 Fed. Reg. 37124 (1977).

51 511 F. Supp. 278 (W.D. La. 1981). See also, U.S. v. P.F.Z. Properties, Inc., 393 F. Supp. 1370 (D.D.C. 1975); Conservation Council of North Carolina v. Costanzo, 398 F. Supp. 653 (E.D.N.C. 1975); U.S. v. Byrd, 609 F.2d 1204 (7th Cir. 1979) and Minnehaha Creek Watershed Dist. v. Hoffman, 597 F.2d 617 (8th Cir. 1979).

52 33 C.F.R. §323.2(c).

53 33 U.S.C. §1344(a).

54 U.S. v. Holland, 373 F. Supp. 665 (M.D. Fla. 1974). See also U.S. v. Fleming Plantations, 12 E.R.C. 1705 (E.D. La. 1978)

55 473 F. Supp. 525 (W.D. La. 1979).

56 526 F.2d 1302, 1306 (5th Cir. 1976).

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58 33 U.S.C. §1344(f)(1). For a discussion of the scope of "normal" farming, silviculture and ranching activities, see Blumm, The Clean Water Act's Section 404 Permit Program Enters Its Adolescence: An Institutitonal and Programmatic Perspective, 8 Ecology L. Q. 420-22 (1980) [Hereinafter Perspective].

59 33 U.S.C. §1344 (f)(2).

60 33 U.S.C. §1344(r). See generally, Perspective at 424-25.

61 33 U.S.C. §1344 (e)(1).

62 33 C.F.R. §323.4-1.

63 Id., §323.4-2.

64 Id., §323.4-3.

65 Id., §323.2(i).

66 Id., §325.1(c).

67 Id., §320.3(b).

68 Id., §325.3.

69 Id., §325.1(d).

70 Id., §320.4(a).

71 Id., §320.4(a)(1).

72 Id. §320.4(a)(1).

73 Id., §320.4(a)(2).

74 Id., §320.4(b)(1).

75 Id., §320.(4)(b)(2).

76 Id.

77 Id., §320.(4)(b)(4).

78 Id.

79 Id., 320.4(b)(3).

80 40 C.F.R. §§230 et. seq.

81 40 C.F.R. §230.1(b).

82 33 U.S.C. §1344(b)(2)(1977).

83 33 U.S.C. §1344(c).

84 16 U.S.C. §§661-66(c).

85 33 C.F.R. §320.4(c).

86 33 C.F.R. §320.4(c).

87 See Perspective supra note 21 at 435-36.

88 33 U.S.C. §1311(a).

89 33 U.S.C. §§1319(d), 1344(s)(5).

90 33 U.S.C. §§1319(c), 1344(s)(4).

91 Perspective supra note 21 at 441.

92 Parkview Corp. v. Dept. of the Army, 490 F. Supp. 1278 (E.D. Wis. 1980); 33 C.F.R. §326.3.

93 U.S. v. Sexton Cove Estates, Inc., 526 F.2d 1293 (5th Cir. 1976); U.S. v. Weisman, 489 F. Supp. 1331 (M.D. Fl. 1980), aff'd 632 F.2d 891 (5th Cir. 1980).

94 Fla. Stat. §§253.123-.124 (1981).

95 The test for navigability is similar to the federal test for purposes of title. Odom v. Deltona Corp., 341 So.2d 977 (Fla. 1976).

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97 Fla. Admin. Code 17-4.28(2).

98 Id., 17-4.02(17),(19).

99 Id., 17-4.28(2)(g).

100 Id., 17-4.28(2)(d).

101 Id.

102 Id.

103 Id., 17-4.02(17).

104 Id., 17-4.02(19).

105 Id.

106 Id., 17-4.28(2).

107 Id., 17-4.28

108 Id., 17-4.04(10). There are detailed conditions or exceptions to the listed exemptions that have been omitted because of their complexity and length.

109 Department of Environmental Regulation, Draft Environmental Impact Statement, the Florida Coastal Management Program, II-47 (1981).

110 Fla. Stat. §403.813(1)(1981).

111 Id., §120.60(2) (1981).

112 Id., §253.123(d), .124(3) (1981).

113 Id., §120.60(2) (1981).

114 Fla. Admin. Code, 17-4, Appendix D.

115 Fla. Stat. §253.123(2)(d) (1981). Dredging for certain types of activities, such as navigation channels, must be shown to be in the public interest. Id., §253.123(3)(a). But see e.g., Ponce De Leon Port Authority vs. State of Florida, Dept. of Environmental Regulation, DOAH Case No. 80-426.

116 Id., §253.124(2).

117 Id.

118 Id., §403.088(3)(b) (1981); Fla. Admin. Code §17-4.28(3).

119 See e.g., Whitehurst & Sons v. D.E.R., No 76-1919 (Recommended Order) (May 17, 1977).

120 Dept of Pollution Control v. Universal Adams, Inc., 44 Fla. Supp. 165 (1974); Farrugia v. Frederick, 344 So.2d 921 (Fla. 1st DCA, 1977).

121 The source for statistical information used in this report is a report by the Executive Office of the Governor, Office of Planning and Budgeting, An Evaluation of the Department of Environmental Regulation Dredge and Fill Permitting Program (March, 1982).

122 Id., Table 5.

123 Id., Table 6.

124 See generally, Maloney, Plager, Ausness & Canter, Florida Water Law, 1980 (Center for Governmental Responsibility).

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127 Id., §373.416(1).

128 Id., §373.403(1).

129 Id., §373.019(10).

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133 Id., 40E-40.302(1)(c).

134 Id., 40E-4.011-4.451.

135 Id., 40E-4.301.

136 Id., 40E-4.301(2)(a); South Florida Water Management District, Basis of Review of Construction of Surface Water Management Systems Serving Projects with Two or More Acres of Impervious Area within the South Florida Water Management District - August, 1980.

137 Id., Basis of Review, VII, A, 5.

138 Id., Basis of Review, VII, A.

139 McVoy, Rhodes, Calvarese, Dean and Sellers, State and Federal Regulation of Construction Activities in the Waters and Wetlands of Florida, 6.6, in the Florida Bar, Continuing Legal Education, Environmental Regulation and Litigation in Florida (1981).

140 33 C.F.R. §329.8(b).

141 Compare e.g. Deltona Corp. v. United States, 11 E.R.C. 20905 (Ct. Cl. 1981) and Zabel v. Pinellas County Water and Navigation Control Authority, 171 So.2d 376 (Fla. 1965). But see Graham v. Estuary Properties, Inc., 399 So.2d 1374 (Fla. 1981).

142 Askew v. Gables-By-the-Sea, Inc., 333 So.2d 56 (Fla. 1st D.C.A. 1976), cert. den., 345 So.2d 420 (Fla. 1977).

143 South Florida Water Management District v. Ratner, 357 So.2d 1055 (Fla. 3d DCA 1978).

144 One field inspector said the job requires knowledge of planning, biology, law, architecture, engineering, soils and hydrology. It takes considerable formal education (at least a Masters Degree) and experience. It takes a year to learn the paperwork.

145 Table 4, DER Dredge and Fill Permitting Program Evaluation, supra note 121.

146 Id., 41.

147 Id., 44.

148 U. S. v. Sexton Cove Estates, Inc., 526 F.2d 1293 (5th Cir. 1976).

149 DER Dredge and Fill Permitting Program Evaluation, supra note 121 at 45.

150 Jacksonville District, Corps of Engineers, Public Notice, General Permit SAJ-31, Fill Activities in Freshwater Wetalnds of Southeast Florida (15 September 1978).

151 Jacksonville District, Corps of Engineers, Public Notice, General Permit SAJ-31, (21 May 1980).

152 COE #78P-1471; DER #13-13967.

153 COE #79P-1334; DER #13-23973.

154 East Everglades Resources Planning Project, Proposed Management Plan for the East Everglades (1980).

155 Case No. 81-0981-CIV-JWK.

156 Case No. 81-0982-CIV-JWK.

157 See generally, U.S. Army Engineer District, Jacksonville, Draft Environmental Impact Statement, Permit Application for Deltona Corporations Residential Development in Wetlands near Marco Island, Florida (August, 1979).

158 Office of the Chief of Engineers, Washington, D.C., Report on Application for Department of the Army Permits to Dredge and Fill at Marco Island, Collier County, Florida (April 15, 1976).

159 40 CFR §230.4(a)(1).

160 33 CFR §209.120(g)(3).

161 Deltona v. Alexander, 504 F.Supp. 1280 (M.D. Fla. 1981).

162 Deltona Corp. v. United States, 11 ELR 20905 (Ct. Cl. 1981).

163 The Deltona Corporation v. State of Florida, Department of Environmental Regulation, DOAH Case Nos. 79-2471; 80-683 (Stipulation for Dismissal and Settlement Agreement).

164 See Generally, Carter et al., Ecosystems Analysis of the Big Cypress Swamp and Estuaries (EPA, 1973); Jacksonville District, Corps of Engineers, Reconnaissance Report, Golden Gate Estates (April, 1980); the Collier County Conservancy, The Naples Bay Study (1979); Golden Gate Estates Study Committee, Phase I, Golden Gate Estates Redevelopment Study (1975); CH_2M-Hill, Proposed Interim Modifications, Golden Gates Estates Canal Systems (November, 1978).

166 See cases listed supra notes 54-56.

167 33 U.S.C. §1344(e).

168 40 C.F.R. §230 et. seq.

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